Agilent 1200 Series Diode Array and Multiple Wavelength Detector

G1315C/D and G1365C/D

Service Manual

Agilent Technologies

Notices

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Manual Structure

The **Service Manual G1315-90112** (English) contains the complete information about the Agilent 1200 Series Diode Array and Multiple Wavelength Detector. It is available as Adobe Reader file (PDF) only.

The **User Manual G1315-90012** (English) and its localized versions contain a subset of the Service Manual and is shipped with the detector in printed matter.

Latest versions of the manuals can be obtained from the Agilent web.

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WARNING

A WARNING notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in personal injury or death. Do not proceed beyond a WARNING notice until the indicated conditions are fully understood and met.

In This Manual...

This manual contains information for using and servicing your Diode Array and Multiple Wavelength Detector G1315C/D and G1365C/D.

1 Introduction

This chapter gives an introduction to the detector, instrument overview and internal connectors.

2 Site Requirements and Specifications

This chapter provides information on environmental requirements, physical and performance specifications.

3 Installing the Detector

This chapter provides information on unpacking, checking on completeness, stack considerations and installation of the detector.

4 LAN Configuration

This chapter provides information on connecting the detector to the Agilent ChemStation PC.

5 Using the Detector

This chapter provides information on how to set up the detector for an analysis and explains the basic settings.

6 How to optimize the Detector

This chapter provides information on how to optimize the detector.

7 Troubleshooting and Diagnostics

This chapter gives an overview about the troubleshooting and diagnostic features and the different user interfaces.

8 Error Information

This chapter describes the meaning of detector error messages, and provides information on probable causes and suggested actions how to recover from error conditions.

9 Test Functions

This chapter describes the detector's built in test functions.

10 Diagnostic Signals

This chapter describes the detector's built in diagnostic signals.

11 Maintenance and Repair

This chapter provides general information on repairing the detector.

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This chapter describes the maintenance of the detector.

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14 Parts and Materials for Maintenance

This chapter provides information on parts for maintenance.

15 Identifying Cables

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This chapter describes the detector in more detail on hardware and electronics.

Annex A Appendix

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This chapter gives an introduction to the detector, instrument overview and internal connectors.

Introduction to the Detector

The detector is designed for highest optical performance, GLP compliance and easy maintenance. It includes the following features:

- 80 Hz data acquisition rate for (ultra-) fast LC applications (requires internal hard disk, SL version only),
- data recovery (DRC) feature provides data-never-lost insurance (requires internal hard disk, SL version only),
- RFID tags for all flow cells and UV-lamps provides traceable information about these assemblies,
- long-life deuterium with RFID tag and tungsten lamps for highest intensity and lowest detection limit over a wavelength range of 190–950 nm,
- no loss in sensitivity for up to eight wavelengths simultaneous,
- programmable slit from 1–16 nm for complete optimization of sensitivity, linearity and spectral resolution,
- optional flow-cell cartridges with RFID tag (standard 10 mm 13 µl, semi-micro 6 mm 5 µl, micro 3 mm 2 µl, 80 nl, 500 nl, 10 mm, high pressure 10 mm 1.7 µl and prep-cells) are available and can be used depending on the application needs,
- easy front access to lamps and flow cell for fast replacement, and
- built-in holmium oxide filter for fast wavelength accuracy verification,
- built-in temperature control for improved baseline stability,
- additional diagnostic signals for temperature and lamp voltage monitoring,

For specifications, see “Performance Specifications” on page 30.

Optical System

The optical system of the detector is shown in Figure 1. Its illumination source is a combination of a deuterium-arc-discharge lamp for the ultraviolet (UV) wavelength range and a tungsten lamp for the visible (VIS) and short-wave near-infrared (SWNIR) wavelength range. The image of the filament of the tungsten lamp is focused on the discharge aperture of the deuterium lamp by means of a special rear-access lamp design which allows both light sources to be optically combined and share a common axis to the source lens. The achromat (source lens) forms a single, focused beam of light through the flow cell. Each cell room and lamp are separated by a quartz window which can be cleaned or replaced. In the spectrograph, light is being dispersed onto the diode array by a holographic grating. This allows simultaneous access to all wavelength information

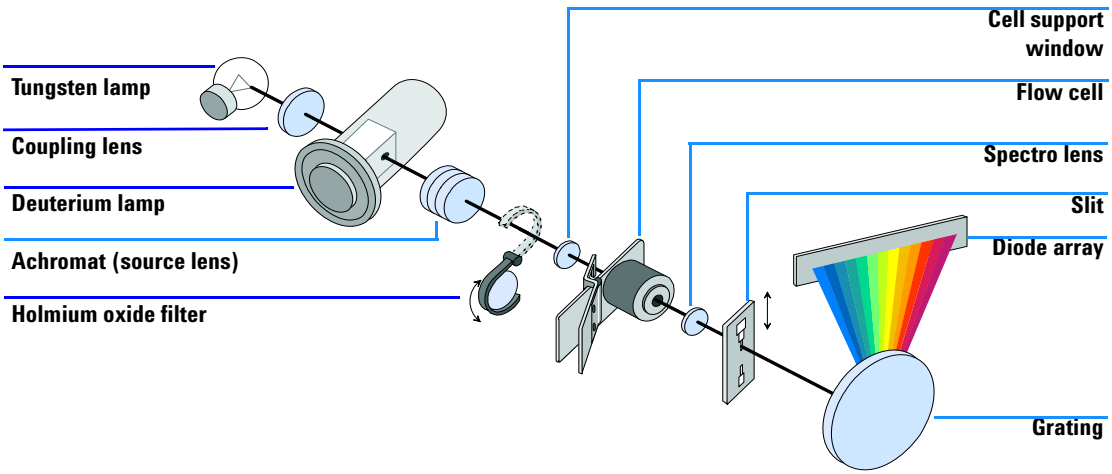


Figure 1 Optical System of the Detector

Lamps

The light source for the UV-wavelength range is a deuterium lamp with a shine-through aperture. As a result of plasma discharge in low-pressure deuterium gas, the lamp emits light over the 190-nm to approximately 800-nm wavelength range. The light source for the visible and SWNIR wavelength range is a low noise tungsten lamp. This lamp emits light over the wavelength range 470 – 950 nm.

Achromat (Source Lens)

The achromat receives the light from both lamps and focuses it so that the beam passes through the flow cell.

Holmium Oxide Filter

The holmium oxide filter is electromechanically actuated. During the holmium filter test it moves into the light path.

Cell Support Window

The cell support window assembly separates the holmium filter area from the flow cell area.

Flow Cell Compartment

The optical unit has a flow cell compartment for easy access to flow cells. A variety of optional flow cells can be inserted using the same quick, simple mounting system. The flow cell can be removed to check the optical and electronic performance of the detector without having influences from the flow cell.

Spectrograph

The spectrograph material is ceramic to reduce thermal effects to a minimum. The spectrograph consists of the spectrograph lens, the variable entrance slit, the grating and the photodiode array with front-end electronics. The spectrograph lens refocuses the light beam after it has passed through the flow cell. The sampling interval of the diode array is < 1 nm over the wavelength range 190 – 950 nm. Depending on the wavelength this varies from 1.0 to 1.25 diodes per nanometer (for example a diode every 0.8 to 1 nm).

For a small wavelength range, the small non-linearity could be neglected. With the wavelength range from 190 – 950 nm a new approach is required to achieve wavelength accuracy over the full range. Each spectrograph is calibrated individually. The calibration data is stored in the spectrograph on an EEPROM. Based on these data, the built-in processors calculate absorbance data with linear intervals (1.0, 2.0, ...) between data points. This results in an excellent wavelength accuracy and instrument-to-instrument reproducibility.

Variable Entrance Slit System

The micro-slit system makes use of the mechanical properties of silicon combined with the precise structuring capabilities of bulk micro-machining. It combines the required optical functions — slit and shutter — in a simple and compact component. The slit width is directly controlled by the micro-processor of the instrument and can be set as method parameter.

Grating The combination of dispersion and spectral imaging is accomplished by using a concave holographic grating. The grating separates the light beam into all its component wavelengths and reflects the light onto the photodiode array.

Diode Array The diode array is a series of 1024 individual photodiodes and control circuits located on a ceramic carrier. With a wavelength range from 190 – 950 nm the sampling interval is < 1 nm.

Early Maintenance Feedback (EMF)

Maintenance requires the exchange of components which are subject to wear or stress. Ideally, the frequency at which components are exchanged should be based on the intensity of usage of the detector and the analytical conditions, and not on a predefined time interval. The early maintenance feedback (EMF) feature monitors the usage of specific components in the instrument, and provides feedback when the user-selectable limits have been exceeded. The visual feedback in the user interface provides an indication that maintenance procedures should be scheduled.

EMF Counters

The detector provides two EMF counters for the lamps. The counters increment increments with lamp use, and can be assigned a maximum limit which provides visual feedback in the user interface when the limit is exceeded. The counters can be reset to zero after the lamp is exchanged. The detector provides the following EMF counters:

- Deuterium Lamp On-Time
- Tungsten Lamp On-Time

Using the EMF Counters

The user-settable EMF limits for the EMF counters enable the early maintenance feedback to be adapted to specific user requirements. The useful lamp burn time is dependent on the requirements for the analysis (high or low sensitivity analysis, wavelength etc.), therefore, the definition of the maximum limits need to be determined based on the specific operating conditions of the instrument.

Setting the EMF Limits

The setting of the EMF limits must be optimized over one or two maintenance cycles. Initially, no EMF limit should be set. When instrument performance indicates maintenance is necessary, take note of the values displayed by lamp counters. Enter these values (or values slightly less than the displayed values)

as EMF limits, and then reset the EMF counters to zero. The next time the EMF counters exceed the new EMF limits, the EMF flag will be displayed, providing a reminder that maintenance needs to be scheduled.

Instrument Layout

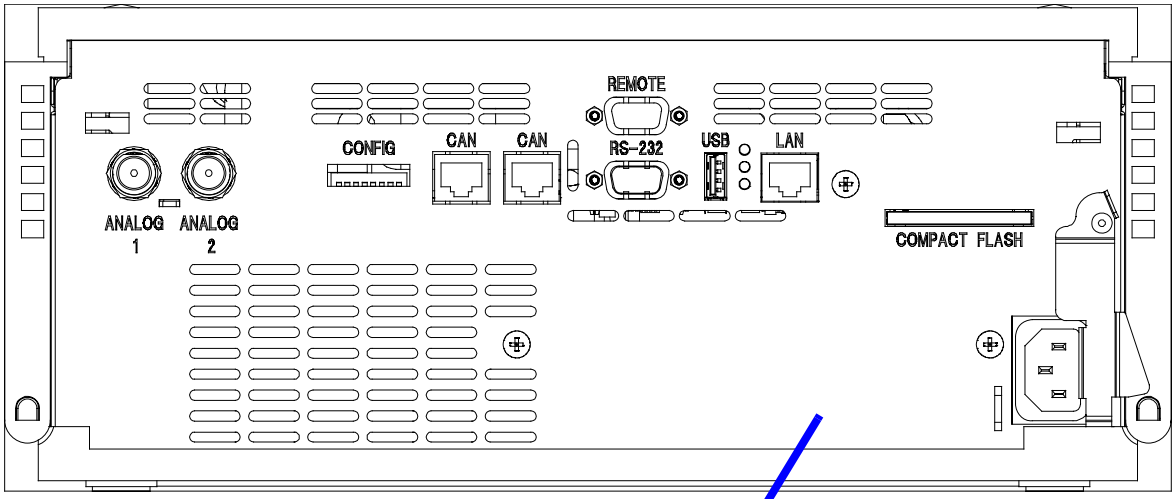
The industrial design of the detector incorporates several innovative features. It uses Agilent's E-PAC concept for the packaging of electronics and mechanical assemblies. This concept is based upon the use of expanded polypropylene (EPP) layers of foam plastic spacers in which the mechanical and electronic boards components of the detector are placed. This pack is then housed in a metal inner cabinet which is enclosed by a plastic external cabinet. The advantages of this packaging technology are:

- virtual elimination of fixing screws, bolts or ties, reducing the number of components and increasing the speed of assembly/disassembly,
- the plastic layers have air channels molded into them so that cooling air can be guided exactly to the required locations,
- the plastic layers help cushion the electronic and mechanical parts from physical shock, and
- the metal inner cabinet shields the internal electronics from electromagnetic interference and also helps to reduce or eliminate radio frequency emissions from the instrument itself.

Electrical Connections

- The CAN bus is a serial bus with high speed data transfer. The two connectors for the CAN bus are used for internal Agilent 1200 Series module data transfer and synchronization.
- Two independent analog outputs provide signals for integrators or data handling systems.
- The REMOTE connector may be used in combination with other analytical instruments from Agilent Technologies if you want to use features such as start, stop, common shut down, prepare, and so on.
- With the appropriate software, the LAN connector may be used to control the detector from a computer through a LAN connection. This connector is activated and can be configured with the configuration switch next to the analog connectors (see "LAN Configuration" on page 47). See your software documentation for further information.
- With the appropriate software, the RS-232 connector may be used to control the detector from a computer through a RS-232 connection (3rd part software or for diagnosis/firmware update). See "RS-232C" on page 371) for further information.
- The power input socket accepts a line voltage of 100 – 240 V AC ± 10 % with a line frequency of 50 or 60 Hz. Maximum power consumption is 300 VA/125 W. There is no voltage selector on your detector because the power supply has a wide-ranging capability. There are no externally accessible fuses, because automatic electronic fuses are implemented in the power supply. The security lever at the power input socket prevents that the detector cover is taken off when line power is still connected.

WARNING **Never use cables other than the ones supplied by Agilent Technologies to ensure proper functionality and compliance with safety or EMC regulations.**



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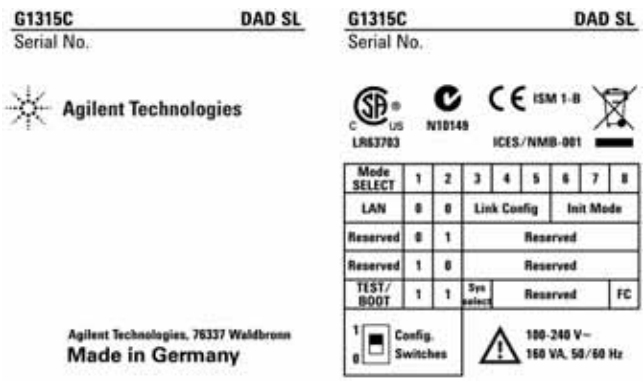

safety standards

configuration switch settings, refer to "Setting the 8-bit Configuration Switch" on page 372

voltage range
power consumption / frequency

Figure 2 Rear View of Detector - Electrical Connections and Label

2
Site Requirements and Specifications

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Performance Specifications 30

This chapter provides information on environmental requirements, physical and performance specifications.

Site Requirements

A suitable environment is important to ensure optimal performance of the detector.

Power Consideration

The detector power supply has wide ranging capabilities and accepts any line voltage in the range mentioned in Table 1. Consequently, there is no voltage selector in the rear of the detector. There are also no externally accessible fuses, because automatic electronic fuses are implemented in the power supply.

WARNING **To disconnect the detector from line, unplug the power cord. The power supply still uses some power, even if the power switch on the front panel is turned off.**

WARNING **Shock hazard or damage of your instrumentation can result, if the devices are connected to a line voltage higher than specified.**

CAUTION Make sure to have easy access to the power cable of the instrument, in order to disconnect the instrument from line.

Power Cords

Different power cords are offered as options with the detector. The female end of all power cords is identical. It plugs into the power-input socket at the rear of the detector. The male end of each power cord is different and designed to match the wall socket of a particular country or region.

WARNING **Never operate your instrumentation from a power outlet that has no ground connection. Never use a power cord other than the Agilent Technologies power cord designed for your region.**

WARNING **Never use cables other than the ones supplied by Agilent Technologies to ensure proper functionality and compliance with safety or EMC regulations.**

Bench Space

The detector dimensions and weight (see Table 1) allows you to place the detector on almost any desk or laboratory bench. It needs an additional 2.5 cm (1.0 inches) of space on either side and approximately 8 cm (3.1 inches) in the rear for air circulation and electric connections.

If the bench should carry a Agilent 1200 Series system, make sure that the bench is designed to bear the weight of all modules.

The detector should be operated in a horizontal position.

Environment

Your detector will work within the specifications at ambient temperatures and relative humidity described in Table 1.

ASTM drift tests require a temperature change below 2 °C/hour (3.6 °F/hour) over one hour period. Our published drift specification (refer also to "Performance Specifications" on page 30) is based on these conditions. Larger ambient temperature changes will result in larger drift.

Better drift performance depends on better control of the temperature fluctuations. To realize the highest performance, minimize the frequency and the amplitude of the temperature changes to below 1 °C/hour (1.8 °F/hour). Turbulences around one minute or less can be ignored.

CAUTION Do not store, ship or use your detector under conditions where temperature fluctuations could cause condensation within the detector. Condensation will damage the system electronics. If your detector was shipped in cold weather, leave it in its box and allow it to warm up slowly to room temperature to avoid condensation.

NOTE The G1315C/D and G1365C/D are designed to operate in a typical electromagnetic environment (EN61326-1) where RF transmitters, such as mobile phones, should not be used in close proximity.

Physical Specifications

Table 1 Physical Specifications G1315C/D and G1365C/D

Type	Specification	Comments
Weight	11.5 kg (26 lbs)	
Dimensions (width × depth × height)	345 × 435 × 140 mm (13.5 × 17 × 5.5 inches)	
Line voltage	100 – 240 VAC, ± 10 %	Wide-ranging capability
Line frequency	50 or 60 Hz ± 5 %	
Power consumption	160 VA /160 W / 546 BTU	Maximum
Ambient operating temperature	0 – 55 °C (32 – 131 °F)	.
Ambient non-operating temperature	-40 – 70 °C (-4 – 158 °F)	
Humidity	< 95%, at 25 – 40 °C (77 – 104 °F)	Non-condensing
Operating altitude	Up to 2000 m (6500 ft)	
Non-operating altitude	Up to 4600 m (14950 ft)	For storing the detector
Safety standards: IEC, CSA, UL, EN	Installation category II, pollution degree 2. For indoor use only. Research Use Only. Not for use in Diagnostic Procedures.	

Performance Specifications

Table 2 Performance Specifications G1315C/D and G1365C/D

Type	Specification	Comments
Detection type	1024-element photodiode array	
Light source	Deuterium and tungsten lamps	The UV-lamp is equipped with RFID tag that holds lamp typical information.
Wavelength range	190 – 950 nm	
Short term noise (ASTM) Single and Multi-Wavelength	± 0.8 × 10^{-5} AU at 254 and 750 nm	See note on page 32
Drift	0.9 × 10^{-3} AU/hr at 254 nm	See note on page 32
Linear absorbance range	> 2 AU (upper limit)	See note on page 32
Wavelength accuracy	± 1 nm	Self-calibration with deuterium lines, verification with holmium oxide filter
Wavelength bunching	1 – 400 nm	Programmable in steps of 1 nm
Slit width	1, 2, 4 , 8, 16 nm	Programmable slit
Diode width	< 1 nm	
Flow cells	Standard: 13 µl volume, 10 mm cell path length and 120 bar (1760 psi) pressure maximum Semi-Micro: 5 µl volume, 6 mm cell path length and 120 bar (1760 psi) pressure maximum Micro: 2 µl volume, 3 mm cell path length and 120 bar (1760 psi) pressure maximum High pressure: 1.7 µl volume, 6 mm cell path length and 400 bar (5880 psi) pressure maximum 500 nano: 0.5 µl volume, 10 mm cell path length and 50 bar (725 psi) pressure maximum 80 nano: 0.5 µl volume, 10 mm cell path length and 50 bar (725 psi) pressure maximum	See "Optimization Overview" on page 107 All flow cells are equipped with RFID tags that hold cell typical information.

Table 2 Performance Specifications G1315C/D and G1365C/D, continued

Type	Specification	Comments
Flow Cells	Prep SST - 3 mm cell path length and 120 bar (1760 psi) pressure maximum Prep Quartz - 0.3 mm mm cell path length and 20 bar (293 psi) pressure maximum Prep Quartz - 0.06 mm mm cell path length and 20 bar (293 psi) pressure maximum	All flow cells are equipped with RFID tags that hold cell typical information.
Control and data evaluation	Agilent ChemStation for LC (32-bit)	• Revision B.01.03 or above (G1315C/G1365C) • Revision B.01.03 SR-2 / B.02.01 SR-2 or above (G1315D/G1365D)
Local Control	Agilent Instant Pilot (G4208A) or Control Module (G1323B)	• Revision B.01.02 or above (G1315C/G1365C) • Revision B.02.01 or above (G1315D/G1365D) • Revision B.04.02
Analog outputs	Recorder/integrator: 100 mV or 1 V, output range 0.001 – 2 AU, two outputs	
Communications	Controller-area network (CAN), RS-232C, APG Remote: ready, start, stop and shut-down signals, LAN	
Safety and maintenance	Extensive diagnostics, error detection and display (through control module and ChemStation), leak detection, safe leak handling, leak output signal for shutdown of pumping system. Low voltages in major maintenance areas.	
GLP features	Early maintenance feedback (EMF) for continuous tracking of instrument usage in terms of lamp burn time with user-setable limits and feedback messages. Electronic records of maintenance and errors. Verification of wavelength accuracy with built-in holmium oxide filter.	
Housing	All materials recyclable.	

NOTE

ASTM: “Standard Practice for Testing Variable Wavelength Photometric Detectors Used in Liquid Chromatography”.

Reference conditions: cell path length 10 mm, time constant 1 s (equal to response time 2 s), flow 1 ml/min LC-grade Methanol, slit width 4 nm.

Linearity measured with caffeine at 265 nm.

For environmental conditions refer to “Environment” on page 27.

Time Constant versus Response Time

According to ASTM E1657-98 „Standard Practice for Testing Variable-Wavelength Photometric Detectors Used in Liquid Chromatography” the time constant is converted to response time by multiplying by the factor 2.2.

3
Installing the Detector

Unpacking the Detector 34
Optimizing the Stack Configuration 36
Installing the Detector 39
Flow Connections to the Detector 42

This chapter provides information on unpacking, checking on completeness, stack considerations and installation of the detector.

Unpacking the Detector

Damaged Packaging

If the delivery packaging shows signs of external damage, please call your Agilent Technologies sales and service office immediately. Inform your service representative that the detector may have been damaged during shipment.

CAUTION If there are signs of damage, please do not attempt to install the detector.

Delivery Checklist

Ensure all parts and materials have been delivered with the detector. The delivery checklist is shown below. Please report missing or damaged parts to your local Agilent Technologies sales and service office.

Table 3 Detector Checklist

Description	Quantity
Detector	1
CompactFlash Card	1 (installed) G1315C/G1365C only
Power cable	1
Cross-over network cable	1
Twisted pair network cable	1
Flow cell	As ordered
User Manual	1
Accessory kit (see Table 4 on page 35	1

Detector Accessory Kit Contents

Table 4 Accessory Kit Contents

Description	Part Number	Quantity
Accessory kit	G1315-68705	
Teflon Tubing flexible i.d. 0.8 mm (flow cell to waste), re-order 5 m	5062-2462	2 m
Corrugated tubing (to waste), re-order 5 m	5062-2463	1.2 m
Fitting male PEEK	0100-1516	2
Capillary column – detector 380 mm long, 0.17 mm i.d. includes:	G1315-87311	1
Ferrule front 1/16" SST, re-order pack of 10	5180-4108 *	2
Ferrule back 1/16" SST, re-order pack of 10	5180-4114 *	2
Fitting 1/16" SST, re-order pack of 10	5061-3303 *	2
Capillary column – cell 150 mm long, 0.17 mm i.d.	G1315-87303	1
CAN cable	5181-1516	1
Wrench open end 1/4 – 5/16 inch	8710-0510	1
Wrench open end 4 mm	8710-1534	1
Hex key 4 mm, 15 cm long, T-handle	8710-2392	1
Hex key 1.5 mm, 10 cm long, straight-handle	8710-2393	1

* or kit 5062-2418 1/16" Fittings and Ferrules (front/back) 10/PK

Optimizing the Stack Configuration

If your detector is part of a complete Agilent 1200 Series system, you can ensure optimum performance by installing the following configuration. This configuration optimizes the system flow path, ensuring minimum delay volume.

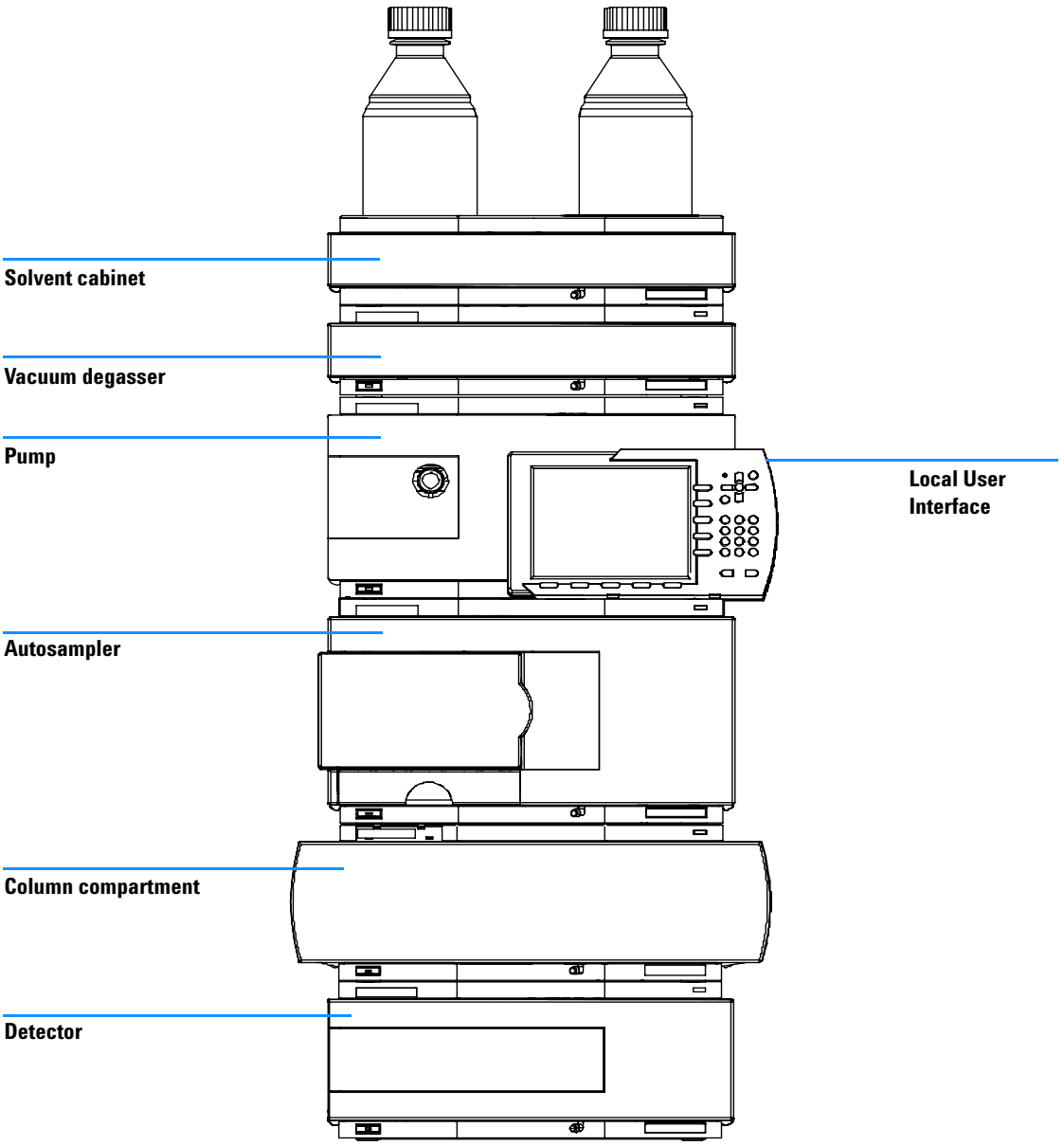


Figure 3 Recommended Stack Configuration (Front View)

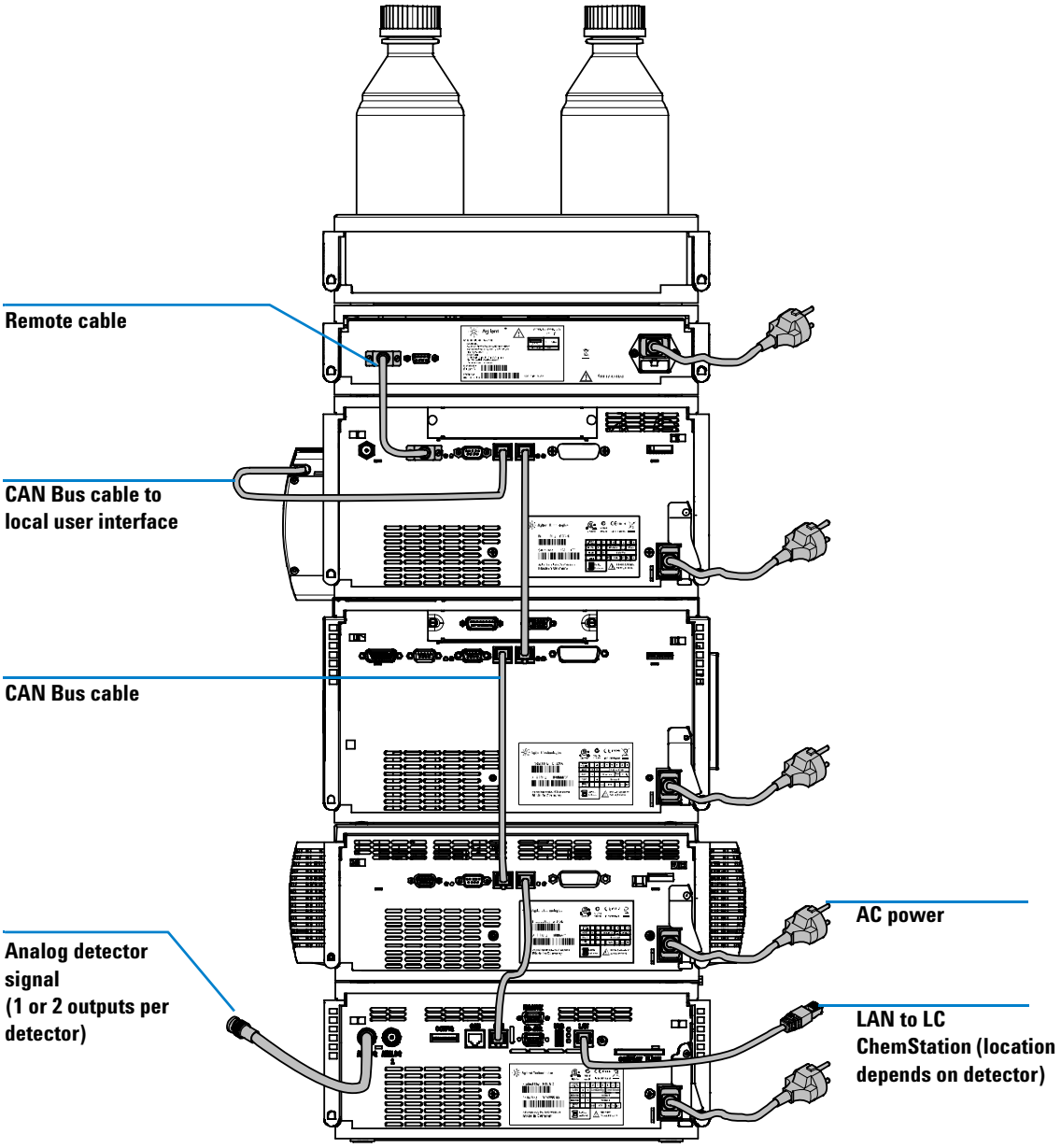

Remote cable
CAN Bus cable to local user interface
CAN Bus cable
Analog detector signal (1 or 2 outputs per detector)
AC power
LAN to LC ChemStation (location depends on detector)

Figure 4 Recommended Stack Configuration (Rear View)

Installing the Detector

Preparations
Locate bench space
Provide power connections
Unpack the detector

Parts required
- Detector
- Power cord
- LAN cable (cross-over or twisted pair network cable)
- for other cables see below and section "Cable Overview" in the Service Manual.
- ChemStation and/or Instant Pilot G4208A or Control Module G1323B with the appropriate revisions, see "Performance Specifications" on page 30.
- Other 1100/1200 modules must have firmware A.06.01 or above.

NOTE Before adding a G1315C/D and G1365C/D into an existing system assure that the existing modules have been updated to firmware revision A.06.01 or above. Otherwise the ChemStation (see "Performance Specifications" on page 30) will not recognize modules.

NOTE Assure that the CompactFlash Card is installed in the rear of the detector (required for operation).

1. Note the MAC address of the LAN interface (rear of the module, under the configuration switch, see Figure 5 on page 40). It's required for "LAN Configuration" on page 47.
2. Place the detector in the stack or on the bench in a horizontal position.
3. Ensure the line power switch at the front of the detector is OFF.
4. Connect the power cable to the power connector at the rear of the detector.
5. Connect the CAN cable to other Agilent 1200 Series modules.
6. Connect the LAN cable (e.g. from a Agilent ChemStation as controller) to the detector's LAN connector.

NOTE In multi-detector configurations the LAN of the G1315C/D and G1365C/D must be used due to its higher data load.

7 Connect the analog cable(s) (optional).

8 Connect the APG remote cable (optional) for non-Agilent 1200 Series instruments.

9 Turn on power by pushing the button at the lower left hand side of the detector. The status LED should be green.

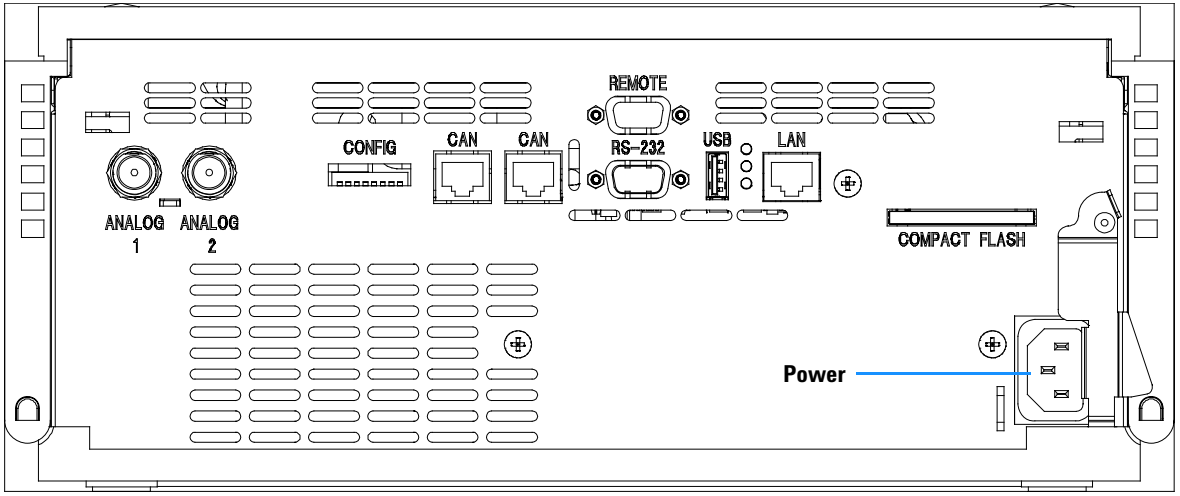


Figure 5 Rear View of Detector

NOTE The PCMICIA slot has been removed from all detectors in November 2006 with the introduction of the G1315D DAD and G1365D MWD.

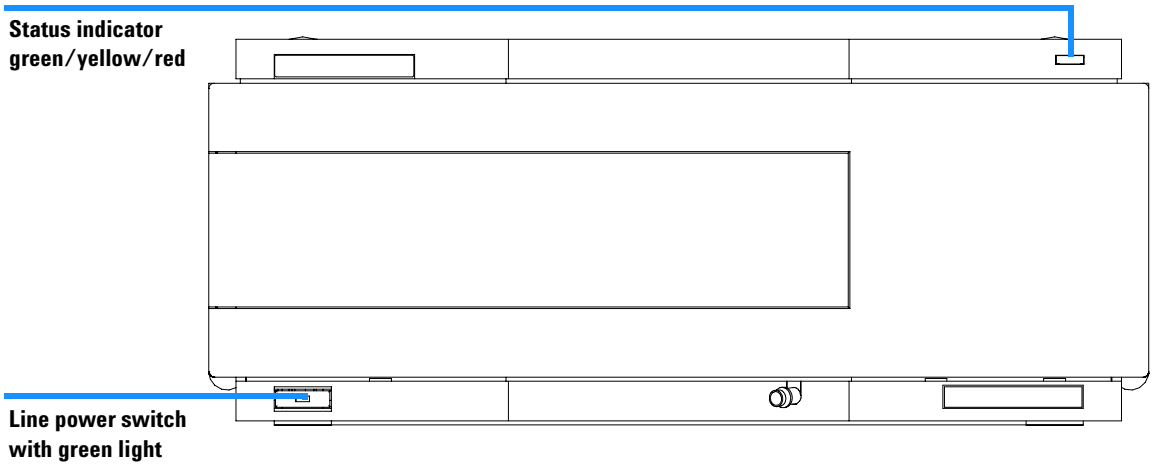


Figure 6 Front View of Detector

NOTE The detector is turned on when the line power switch is pressed and the green indicator lamp is illuminated. The detector is turned off when the line power switch is protruding and the green light is off.

WARNING **To disconnect the detector from line, unplug the power cord. The power supply still uses some power, even if the power switch at the front panel is turned off.**

NOTE The detector was shipped with default configuration settings. To change these settings see "Configuration Switches" on page 50.

Flow Connections to the Detector

Preparations	Detector is installed in the LC system.
Parts required	Other modules Parts from accessory kit, see"Detector Accessory Kit Contents" on page 35. Two wrenches 1/4 – 5/16 inch for capillary connections

WARNING **When working with solvents please observe appropriate safety procedures (for example, goggles, safety gloves and protective clothing) as described in the material handling and safety data sheet supplied by the solvent vendor, especially when toxic or hazardous solvents are used.**

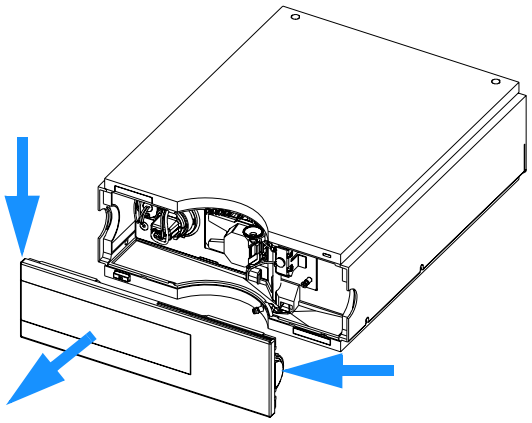
NOTE The flow cell is shipped with a filling of isopropanol (also recommended when the instrument and/or flow cell is shipped to another location). This is to avoid breakage due to subambient conditions.

NOTE The detector should be operated with the front cover in place to protect the flow cell area against strong drafts from the outside and to cover the deuterium lamp.

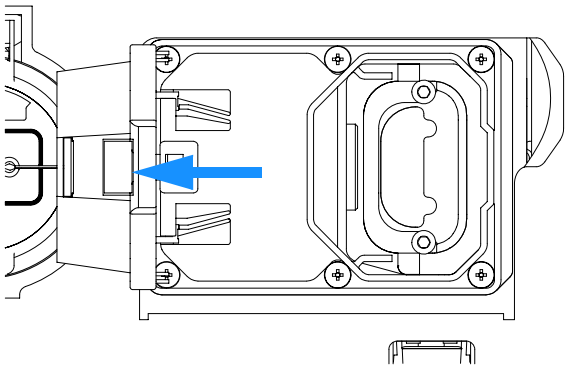
Some types of the Agilent deuterium lamps show a light ring during operation. This is not harmful, refer to "UV-Radiation" on page 388.

NOTE The heat exchanger/capillary and the cell body can be fixed mirror symmetrically to have both capillaries routed to the bottom or to the top (depending on the routing of the capillaries to the column). For details see "Replacing Capillaries on a Standard Flow Cell" on page 222.

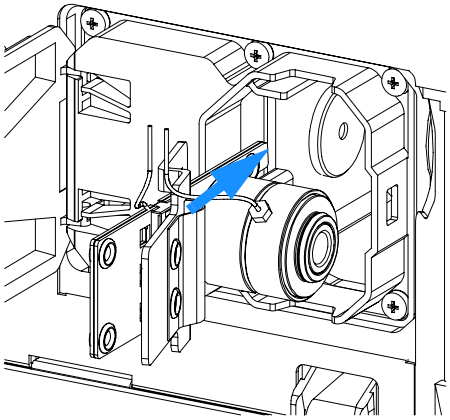
1 Press the release buttons and remove the front cover to gain access to the flow cell area.



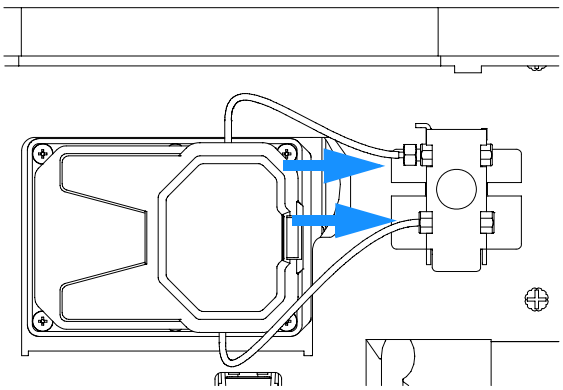
2 Press the release button and open the flow cell door.



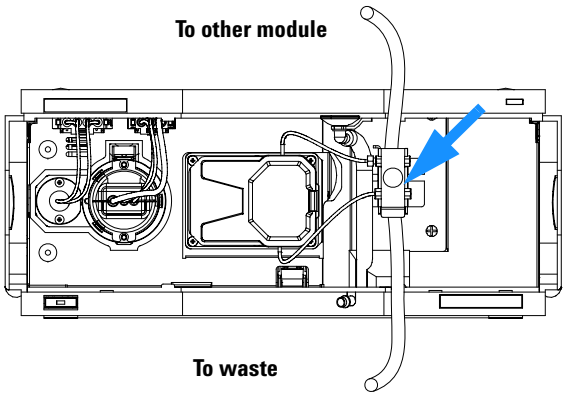
3 Insert the flow cell.



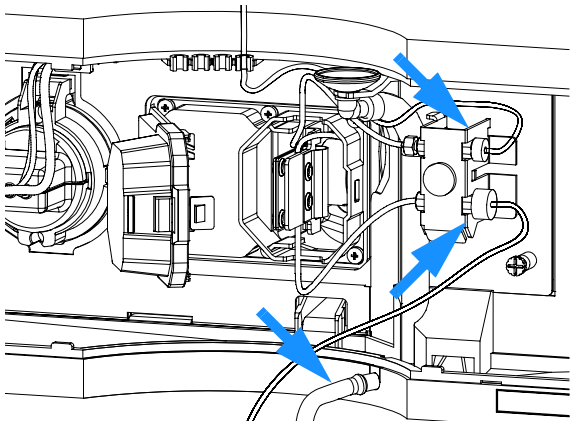
4 Connect the flow cell capillaries to the capillary holder (top is inlet, bottom is outlet).



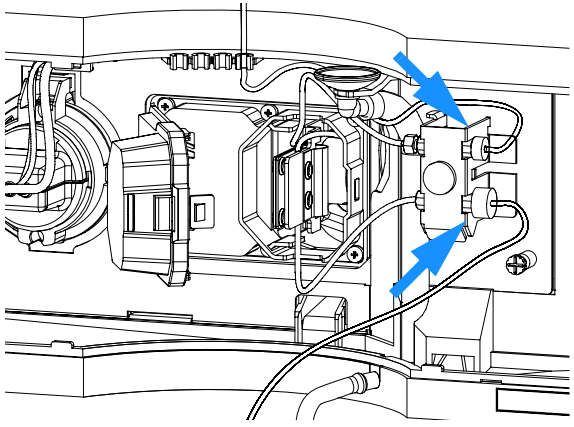
5 If another Agilent 1200 Series module is positioned on top of the detector, route the tubing assembly waste from the accessory kit behind the capillary holder and connect the top end to the other module's waste outlet.



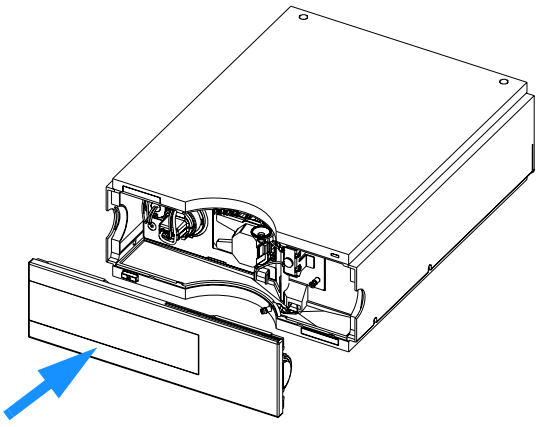
6 Connect the capillary from the column to the capillary holder (top). Connect the teflon waste tubing to the flow cell outlet fitting (bottom) and the corrugated waste tubing to the leak outlet.



7 Remove the flow cell and establish a flow and observe for leaks.



8 Insert the flow cell, close the cover and replace the front cover.



The installation of the detector is complete now.

Setting up the LAN access

Please follow the instructions in “LAN Configuration” on page 47

4
LAN Configuration

What you have to do first 48
TCP/IP parameter configuration 49
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Initialization mode selection 51
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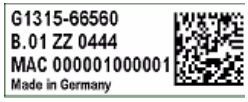
With the Handheld Controller (G1323B) 68
Manual Configuration 62
PC and Agilent ChemStation Setup 71

This chapter provides information on connecting the detector to the Agilent ChemStation PC.

What you have to do first

The G1315C/D and G1365C/D have an on-board LAN communication interface.

1 Note the MAC (Media Access Control) address for further reference. The MAC or hardware address of the LAN interfaces is a world wide unique identifier. No other network device will have the same hardware address. The MAC address can be found on a label at the rear of the detector underneath the configuration switch (see Figure 8).



Part number of the detector main board
Revision Code, Vendor, Year and Week of assembly
MAC address
Country of Origin

Figure 7 MAC-Label

2 Connect the instrument's LAN interface (see Figure 8) to

a the PC network card using a crossover network cable (point-to-point) or

b a hub or switch using a standard LAN cable.

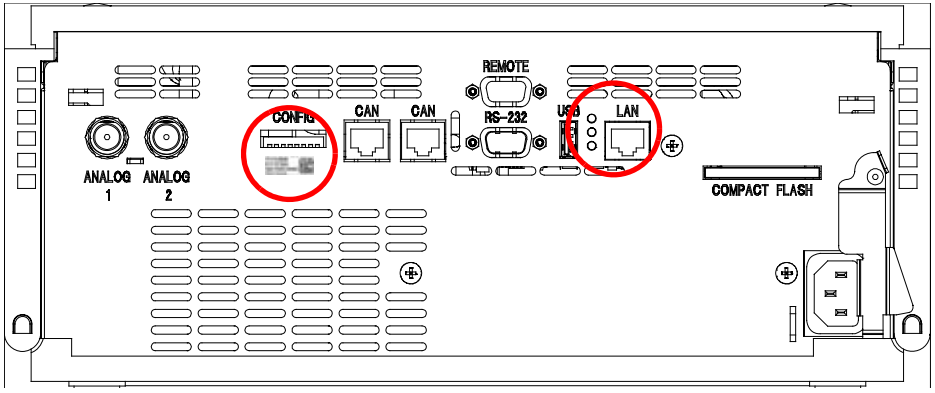


Figure 8 Location of LAN interface and MAC label

TCP/IP parameter configuration

To operate properly in a network environment, the LAN interface must be configured with valid TCP/IP network parameters. These parameters are:

- IP address
- Subnet Mask
- Default Gateway

The TCP/IP parameters can be configured by the following methods:

- by automatically requesting the parameters from a network-based BOOTP Server (using the so-called Bootstrap Protocol)
- by manually setting the parameters using Telnet
- by manually setting the parameters using the Handheld Controller (G1323B), see page 68 or Instant Pilot (G4208A), see page 67.

The LAN interface differentiates between several initialization modes. The initialization mode (short form ‘init mode’) defines how to determine the active TCP/IP parameters after power-on. The parameters may be derived from a Bootp cycle, non-volatile memory or initialized with known default values. The initialization mode is selected by the configuration switch, see Figure 9 on page 50.

Configuration Switches

The configuration switch can be accessed at the rear of the detector, see Figure 9.

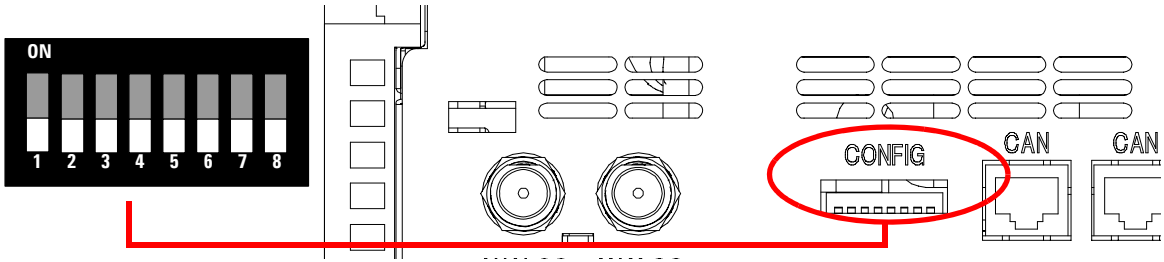


Figure 9 Location of Configuration Switches

The detector is shipped with all switches set to OFF, as shown above.

NOTE To perform any LAN configuration, SW1 and SW2 must be set to OFF.

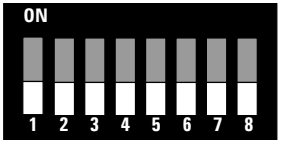
Table 5 Factory Default Settings

Initialization ('Init') Mode	Bootp, all switches down. For details see "Bootp" on page 51
Link Configuration	speed and duplex mode determined by auto-negotiation, for details see "Link configuration selection" on page 55

Initialization mode selection

The following initialization (init) modes are selectable:

Table 6 Initialization Mode Switches

	SW 6	SW 7	SW 8	Init Mode
	OFF	OFF	OFF	Bootp
	OFF	OFF	ON	Bootp & Store
	OFF	ON	OFF	Using Stored
	OFF	ON	ON	Using Default

Bootp

When the initialization mode “Bootp” is selected, the detector tries to download the parameters from a Bootp Server. The parameters obtained become the active parameters immediately. They are not stored to the non-volatile memory of the detector. Therefore, the parameters are lost with the next power cycle of the detector.

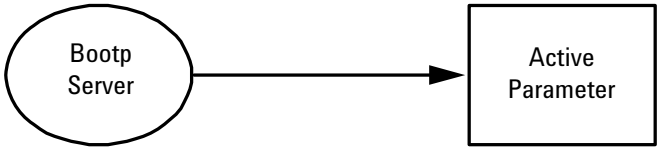


Figure 10 Bootp (Principle)

Bootp & Store

When “Bootp & Store” is selected, the parameters obtained from a Bootp Server become the active parameters immediately. In addition, they are stored to the non-volatile memory of the detector. Thus, after a power cycle they are still available. This enables a kind of “bootp once” configuration of the detector.

Example: The user may not want to have a Bootp Server be active in his network all the time. But on the other side, he may not have any other configuration method than Bootp. In this case he starts the Bootp Server temporarily, powers on the detector using the initialization mode “Bootp & Store”, waits for the Bootp cycle to be completed, closes the Bootp Server and powers off the detector. Then he selects the initialization mode “Using Stored” and powers on the detector again. From now on, he is able to establish the TCP/IP connection to the detector with the parameters obtained in that single Bootp cycle.

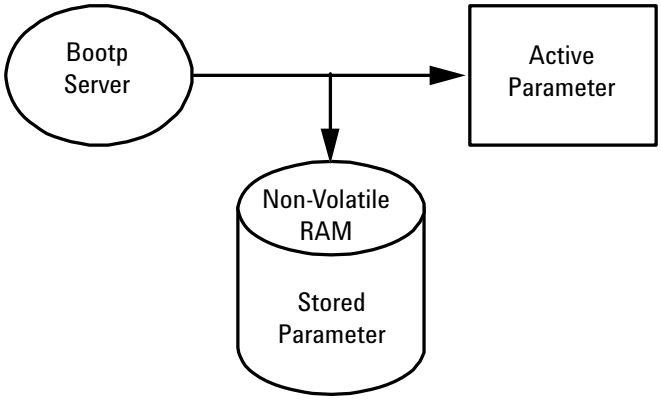


Figure 11 Bootp & Store (Principle)

NOTE Use the initialization mode “Bootp & Store” carefully, because writing to the non-volatile memory takes time. Therefore, when the detector shall obtain its parameters from a Bootp Server every time it is powered on, the recommended initialization mode is “Bootp”!

Using Stored

When initialization mode “Using Stored” is selected, the parameters are taken from the non-volatile memory of the detector. The TCP/IP connection will be established using these parameters. The parameters were configured previously by one of the described methods.

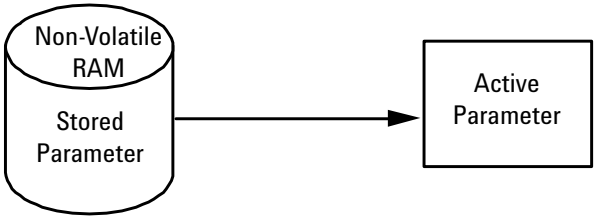


Figure 12 Using Stored (Principle)

Using Default

When “Using Default” is selected, the factory default parameters are taken instead. These parameters enable a TCP/IP connection to the LAN interface without further configuration, see Table 7.

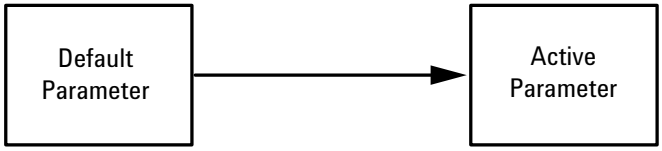


Figure 13 Using Default (Principle)

NOTE Using the default address in your local area network may result in network problems. Take care and change it to a valid address immediately.

Table 7 Using Default Parameters

IP address:	192.168.254.11
Subnet Mask:	255.255.255.0
Default Gateway	not specified

Since the default IP address is a so-called local address, it will not be routed by any network device. Thus, the PC and the detector must reside in the same subnet.

The user may open a Telnet session using the default IP address and change the parameters stored in the non-volatile memory of the detector. He may then close the session, select the initialization mode “Using Stored”, power-on again and establish the TCP/IP connection using the new parameters.

When the detector is wired to the PC directly (e.g. using a cross-over cable or a local hub), separated from the local area network, the user may simply keep the default parameters to establish the TCP/IP connection.

NOTE

In the “Using Default” mode, the parameters stored in the memory of the detector are not cleared automatically. If not changed by the user, they are still available, when switching back to the mode “Using Stored”.

Link configuration selection

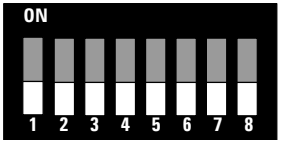
The LAN interface supports 10 or 100 Mbps operation in full- or half-duplex modes. In most cases, full-duplex is supported when the connecting network device - such as a network switch or hub - supports IEEE 802.3u auto-negotiation specifications.

When connecting to network devices that do not support auto-negotiation, the LAN interface will configure itself for 10- or 100-Mbps half-duplex operation.

For example, when connected to a non-negotiating 10-Mbps hub, the LAN interface will be automatically set to operate at 10-Mbps half-duplex.

If the detector is not able to connect to the network through auto-negotiation, you can manually set the link operating mode using link configuration switches on the detector.

Table 8 Link Configuration Switches

	SW 3	SW 4	SW 5	Link Configuration
	OFF	-	-	speed and duplex mode determined by auto-negotiation
	ON	OFF	OFF	manually set to 10 Mbps, half-duplex
	ON	OFF	ON	manually set to 10 Mbps, full-duplex
	ON	ON	OFF	manually set to 100 Mbps, half-duplex
	ON	ON	ON	manually set to 100 Mbps, full-duplex

Automatic configuration with Bootp

When automatic configuration with Bootp is selected and the LAN interface is powered on, it broadcasts a BOOTP (Bootstrap Protocol) request that contains its MAC (hardware) address. A BOOTP server daemon searches its database for a matching MAC address, and if successful, sends the corresponding configuration parameters to the detector as a BOOTP reply. These parameters become the active TCP/IP parameters immediately and the TCP/IP connection can be established.

Configuring the Agilent Bootp service program

NOTE All examples shown in this chapter will not work in your environment. You need your own IP-, Subnet-Mask- and Gateway addresses.

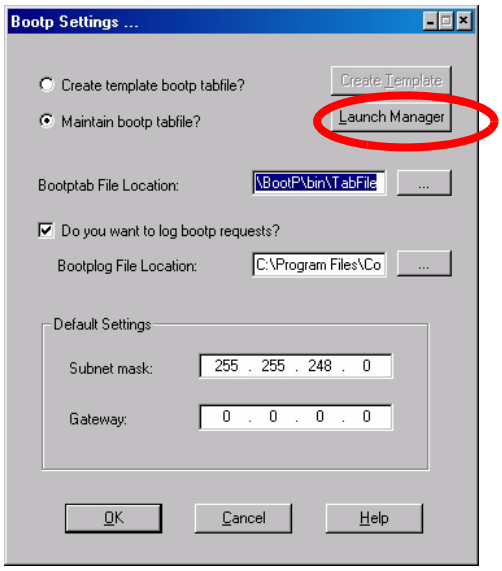
NOTE Assure that the detector configuration switch is set properly. The setting should be either **Bootp** or **Bootp & Store,** see Table 6 on page 51.

NOTE Assure that the detector connected to the network is powered off.

NOTE If the Agilent Bootp Service program is not already installed on your PC, then install it from your Agilent ChemStation CD-ROM, located in folder \Bootp. The screens refer to version B.01.0x

1 The Agilent Bootp Service is placed in the start-up group and automatically is started during the boot process of the PC.

2 Open the Bootp Settings window (Figure 14) and enter the default settings for your setup.



location of LogFile and TabFile

Figure 14 Bootp Service Settings

3 Launch the Manager. It will open the Bootp Manager screen, see Figure 15. This shows all network hardware that has been added (initially empty).

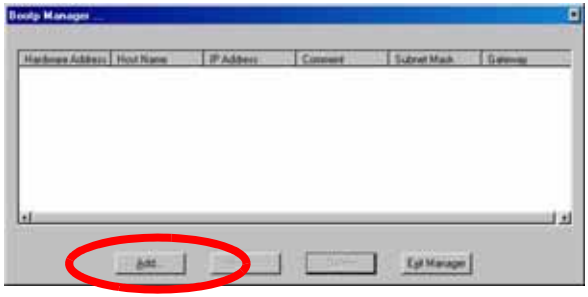


Figure 15 Bootp Manager

4 Select Add to enter the enter the module specific information, see Figure 16:

- MAC address (from label on the instrument)
- host name
- IP address
- comment (instrument name / location)
- subnet mask (if different)
- gateway (if required)

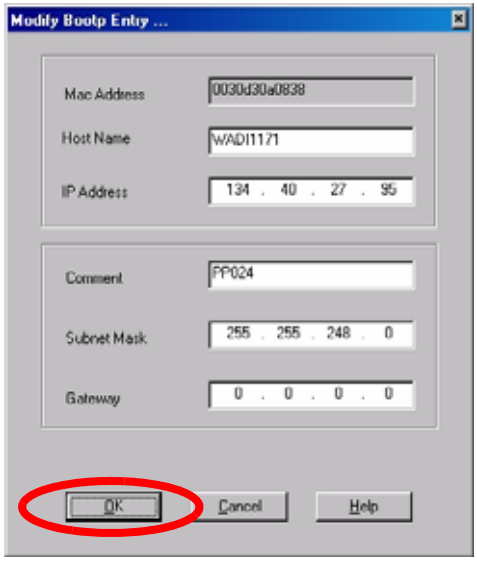


Figure 16 Bootp Manager - Enter your parameter

5 Press OK. The parameter are added to the Bootp Manager, see Figure 16 and added to the TabFile, see Figure 14 on page 57:

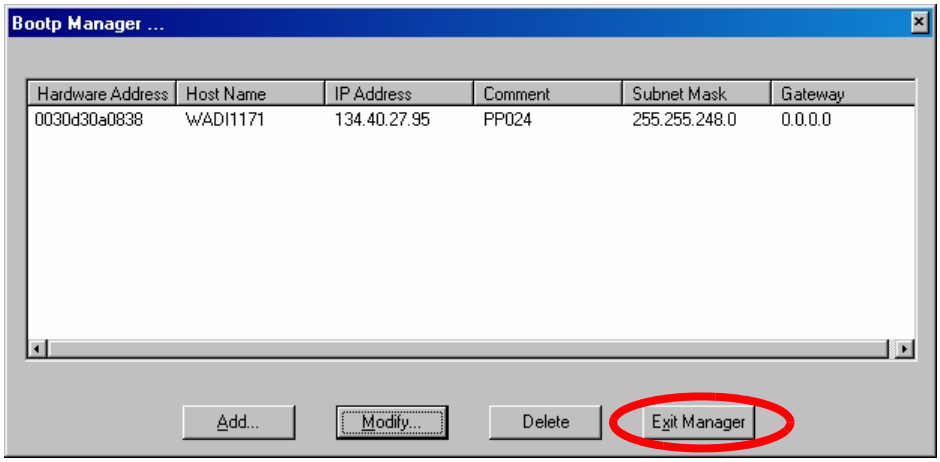


Figure 17 Bootp Manager - check your entries

6 Press Exit Manager and OK to exit the Agilent Bootp Service.

7 Now turn on the module with the detector, wait about 30-60 seconds and view the LogFile, see Figure 18. It should display the request from the detector with the hardware (MAC) address.

02/03/05 16:33:56 PM
Status: BOOTP Request received at outer most layer
Status: BOOTP Request received from hardware address: 0030D30A0838
Status: found 134.40.27.95 WADI1171:
Status: Host IP Address is: 134.40.29.56
Status: Reply to BOOTP Request has been sent
Status: BOOTP Request finished processing at outer most layer

Figure 18 LogFile - the detector has received the parameter

NOTE

When using this **Bootp** mode, the parameters are not written into the non-volatile memory of the detector. If you delete this Bootp Configuration, the Bootp Manager will show up as shown in Figure 15 on page 57 (**Bootp** mode).

If you want to store your parameters permanently on the detector (for use without the Agilent Bootp service), refer to "Storing the settings permanently with Bootp" on page 61.

Storing the settings permanently with Bootp

If you want to change parameters of the detector using the Bootp follow the instructions below.

1. Turn off the detector.
2. Change the detector's settings of the Configuration Switch to **"Bootp & Store"** mode, see Table 6 on page 51.
3. Start the Agilent Bootp Service and open its window.
4. If required, modify the parameters for the detector according to your needs using the existing configuration.
5. Press *OK* to exit the Bootp Manager.
6. Now turn on the detector and view the Bootp Server window. After some time the Agilent Bootp Service will display the request from the LAN interface. The parameters are now stored permanently in the non-volatile memory of the detector.
7. Close the Agilent Bootp Service and turn off the detector.
8. Change the settings of the detector's Configuration Switch to **"Using Stored"** mode, see Table 6 on page 51.
9. Power cycle the detector. The detector can be accessed now via LAN without the Agilent Bootp Service, refer to "PC and Agilent ChemStation Setup" on page 71.

Manual Configuration

Manual configuration only alters the set of parameters stored in the non-volatile memory of the detector. It never affects the currently active parameters. Therefore, manual configuration can be done at any time. A power cycle is mandatory to make the stored parameters become the active parameters, given that the initialization mode selection switches are allowing it.

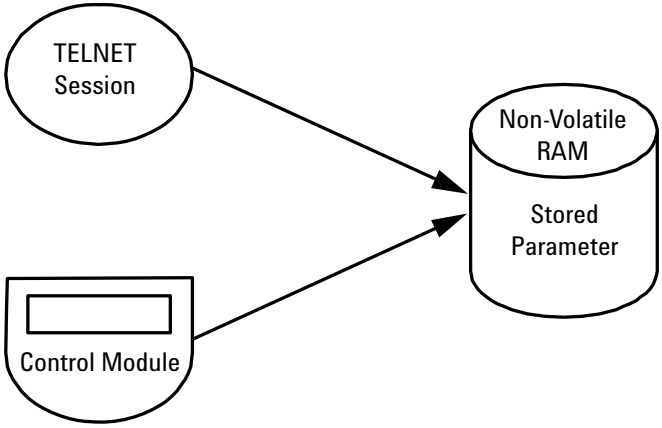


Figure 19 Manual Configuration (Principle)

With Telnet

Whenever a TCP/IP connection to the detector is possible (TCP/IP parameters set by any method), the parameters may be altered by opening a Telnet session.

1 Open the system (DOS) prompt window by clicking on Windows START button and select "*Run...*". Type "cmd" and press OK.

2 Type the following at the system (DOS) prompt:

```
c:\>telnet <IP address> or
c:\>telnet <host name>
```

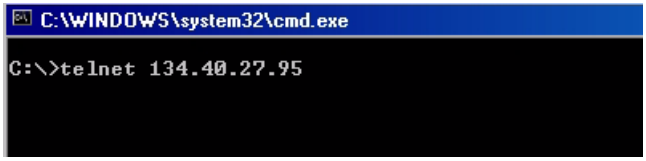


Figure 20 Telnet - Starting a session

where <IP address> may be the assigned address from a Bootp cycle, a configuration session with the Handheld Controller (G1323B), or the default IP address (see "Configuration Switches" on page 50).

When the connection was established successfully, the detector responds with the following:

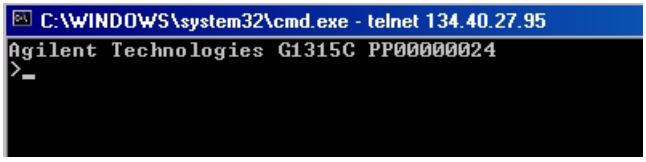


Figure 21 A connection to the module is made

3 Type ? and press enter to see the available commands.

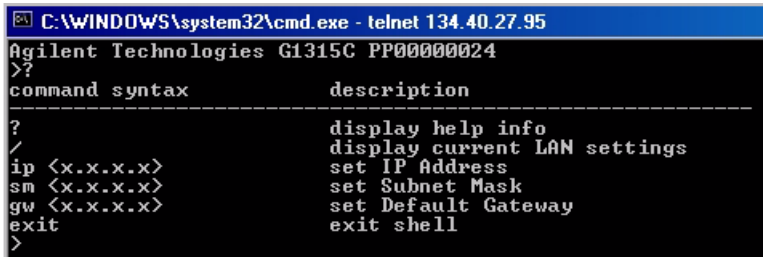


Figure 22 Telnet Commands

Table 9 Telnet Commands

Value	Description
?	displays syntax and descriptions of commands
/	displays current LAN settings
ip <x.x.x.x>	sets new ip address
sm <x.x.x.x>	sets new subnet mask
gw <x.x.x.x>	sets new default gateway
exit	exits shell and saves all changes

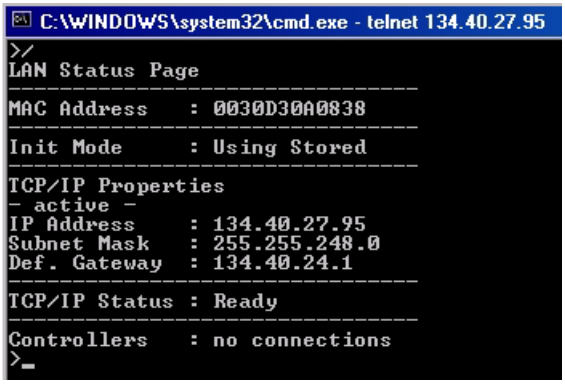
4 To change a parameter follows the style:

parameter value

for example: `ip 134.40.27.230`

then press [Enter], where parameter refers to the configuration parameter you are defining, and value refers to the definitions you are assigning to that parameter. Each parameter entry is followed by a carriage return.

5 Use the "/" and press Enter to list the current settings.



information about the LAN interface
MAC address, initialization mode

Initialization mode is Using Stored

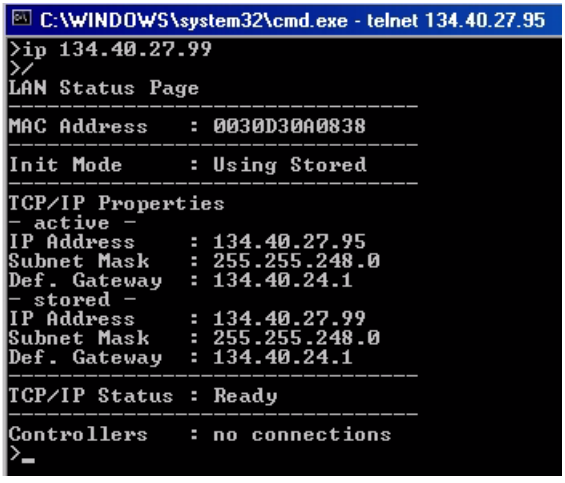
active TCP/IP settings

TCP/IP status - here ready

connected to PC with controller software (e.g. Agilent ChemStation), here not connected

Figure 23 Telnet - Current settings in "Using Stored" mode

6 Change the IP address (in this example 134.40.27.99) and type "/" to list current settings.



change of IP setting to

Initialization mode is Using Stored

active TCP/IP settings

stored TCP/IP settings in non-volatile memory

connected to PC with controller software (e.g. Agilent ChemStation), here not connected

Figure 24 Telnet - Change IP settings

7 When you have finished typing the configuration parameters, type:

`exit` and press [Enter] to exit with storing parameters.

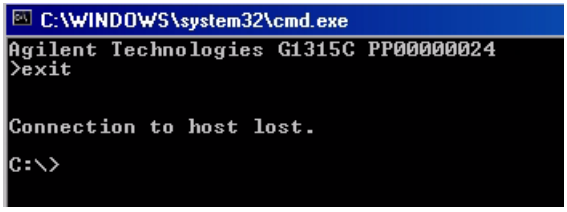


Figure 25 Closing the Telnet Session

NOTE If the Initialization Mode Switch is changed now to “Using Stored” mode, the instrument will take the stored settings when the module is re-booted. In the example above it would be 134.40.27.99.

With the Instant Pilot (G4208A)

To configure the TCP/IP parameters before connecting the detector to the network, the Instant Pilot (G4208A) can be used.

1 From the Welcome screen press the **More** button.

2 Select **Configure.**

3 Press the **DAD** (MWD) button.

4 Scroll down to the LAN settings.

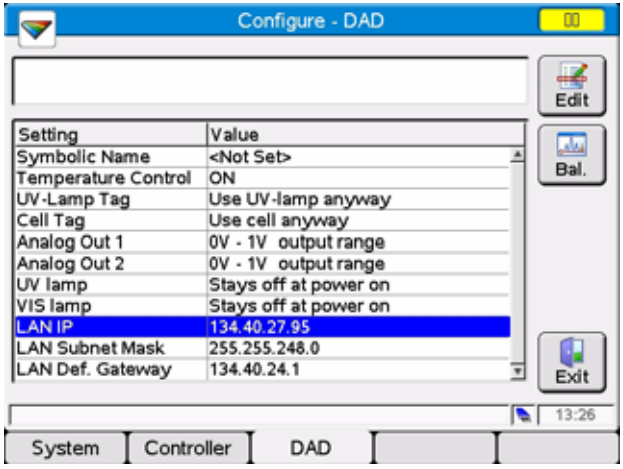


Figure 26 Instant Pilot - LAN Configuration

5 Press the **Edit** button, perform the required changes and press the **Done** button.

6 Leave the screen by pressing the **Exit** button.

With the Handheld Controller (G1323B)

To configure the TCP/IP parameters before connecting the detector to the network, the Handheld Controller (G1323B with firmware B.04.02 or above) can be used.

1 Press F5 “Views”, select “System” and press the “Enter” key.

2 Press F2 “Configure”, select the module where the LAN cable is installed and press the “Enter” key (Figure 27).

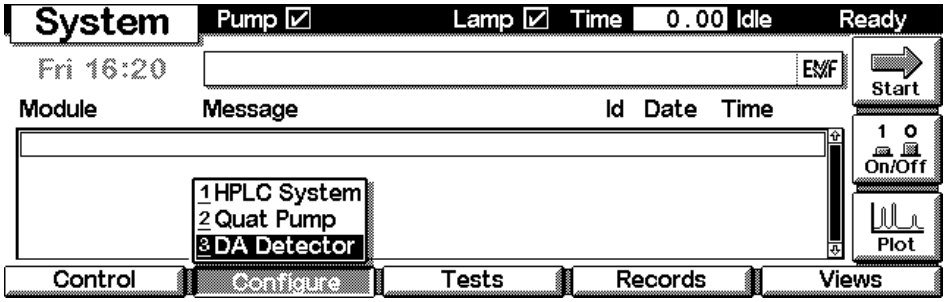


Figure 27 Select module

3 Press F1 “LAN” (Figure 28).

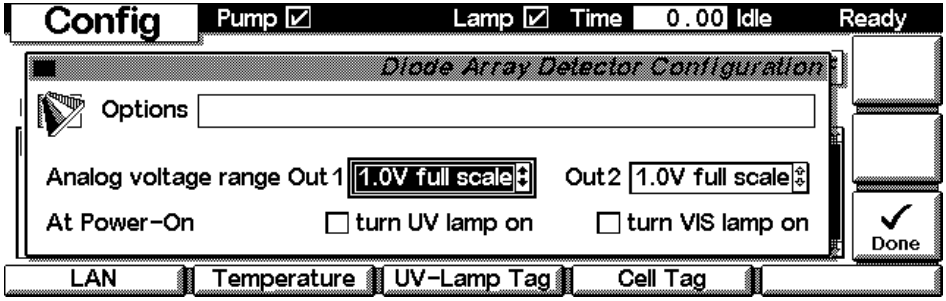


Figure 28 Select LAN

4 After the Handheld Controller was reading out the LAN interface you will get an overview of the LAN settings (LAN Status Page). The information corresponds to the information in Figure 23 on page 65.

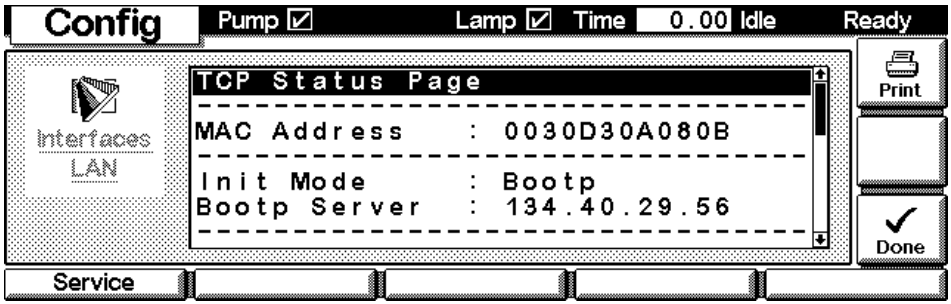


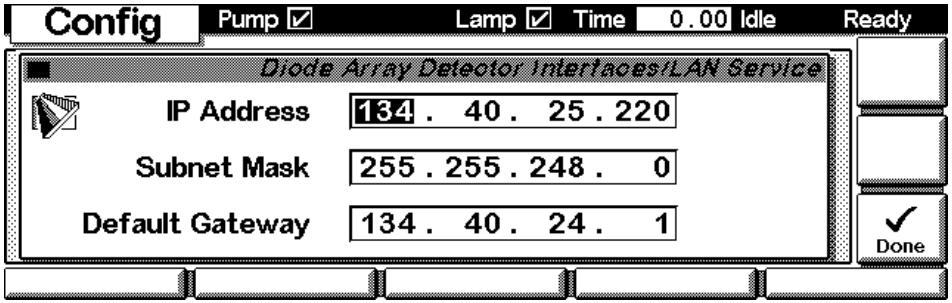
Figure 29 Diode Array and Multiple Wavelength Detector Status Page

In Figure 30 on page 69 the complete listing is shown. For explanations refer to Figure 23 on page 65.

```
LAN Status Page
-------------------------------
MAC Address    : 0030d30A080B
-------------------------------
Init Mode      : Bootp
Bootp Server   : 134.40.29.56
-------------------------------
TCP/IP Properties
- active -
IP Address     : 134.40.25.220
Subnet Mask    : 255.255.248.0
Def. Gateway   : 0.0.0.0
- stored -
IP Address     : 134.40.25.220
Subnet Mask    : 255.255.248.0
Def. Gateway   : 134.40.24.1
-------------------------------
TCP/IP Status : Ready
-------------------------------
Controllers     : no connections
```

Figure 30 LAN interface Status Page (complete)

5 To change the TCP/IP settings, press F1 “Service”.



6 Move to the parameter you want to change, enter the new value and press “Enter”.

7 If you completed your changes, press “Done” to leave the Service section.

8 Press F6 “Done” and restart the module by pressing “OK”.

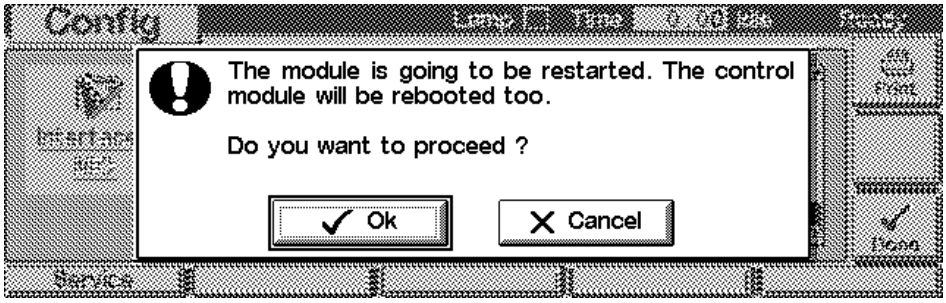


Figure 31 Re-boot screen

PC and Agilent ChemStation Setup

PC Setup for Local Configuration

This procedure describes the change of the TCP/IP settings on your PC to match the detector's default parameters in a local configuration (see also "Using Default" on page 53).

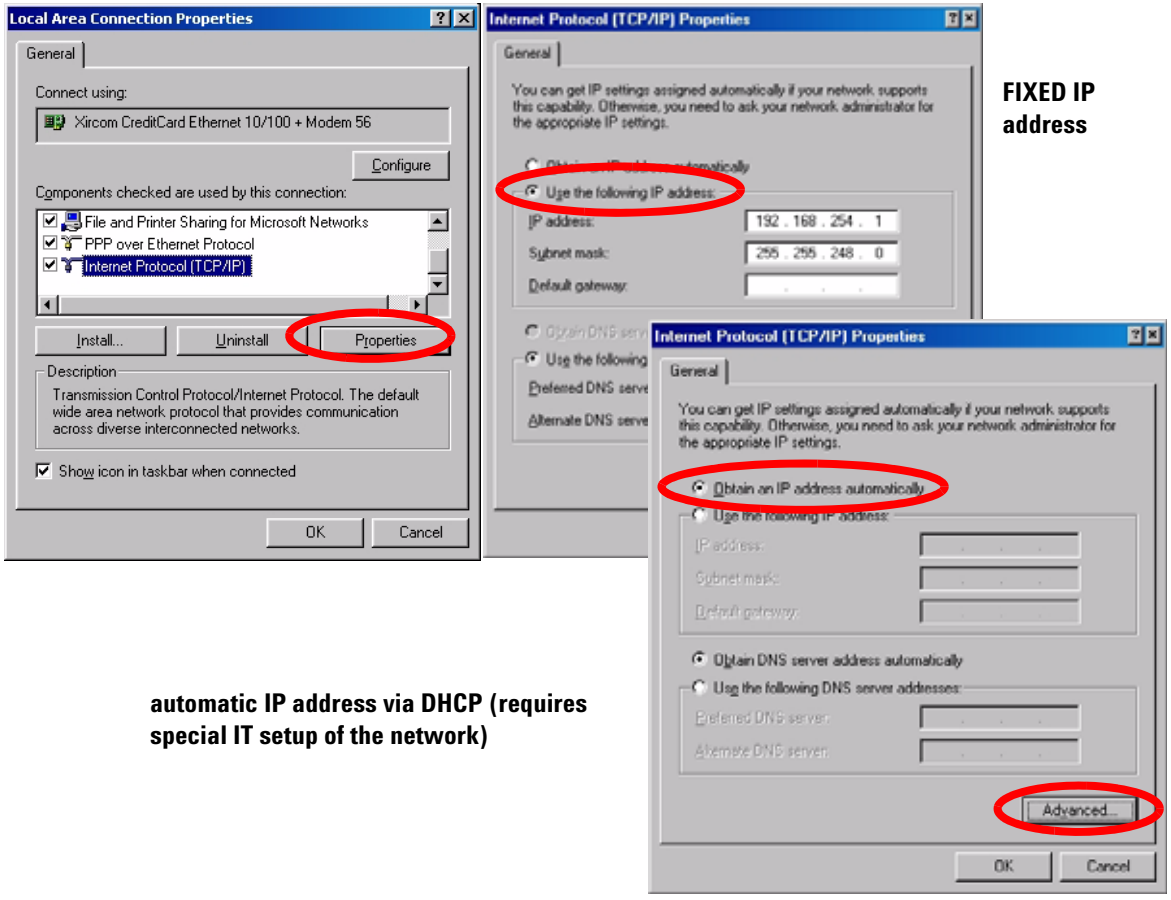

Local Area Connection Properties
General
Connect using:
Xircom CreditCard Ethernet 10/100 + Modem 56
Configure
Components checked are used by this connection:
File and Printer Sharing for Microsoft Networks
PPP over Ethernet Protocol
Internet Protocol (TCP/IP)
Install...
Uninstall
Properties
Description
Transmission Control Protocol/Internet Protocol. The default wide area network protocol that provides communication across diverse interconnected networks.
Show icon in taskbar when connected
OK
Cancel
Internet Protocol (TCP/IP) Properties
General
You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.
Use the following IP address:
IP address:
192 . 168 . 254 . 1
Subnet mask:
255 . 255 . 248 . 0
Default gateway:
FIXED IP address
Internet Protocol (TCP/IP) Properties
General
You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.
Obtain an IP address automatically
Obtain DNS server address automatically
Use the following DNS server addresses:
Advanced...
OK
Cancel
automatic IP address via DHCP (requires special IT setup of the network)

Figure 32 Changing the TCP/IP settings of the PC

Agilent ChemStation Setup

1 Start the Configuration Editor of the Agilent ChemStation.

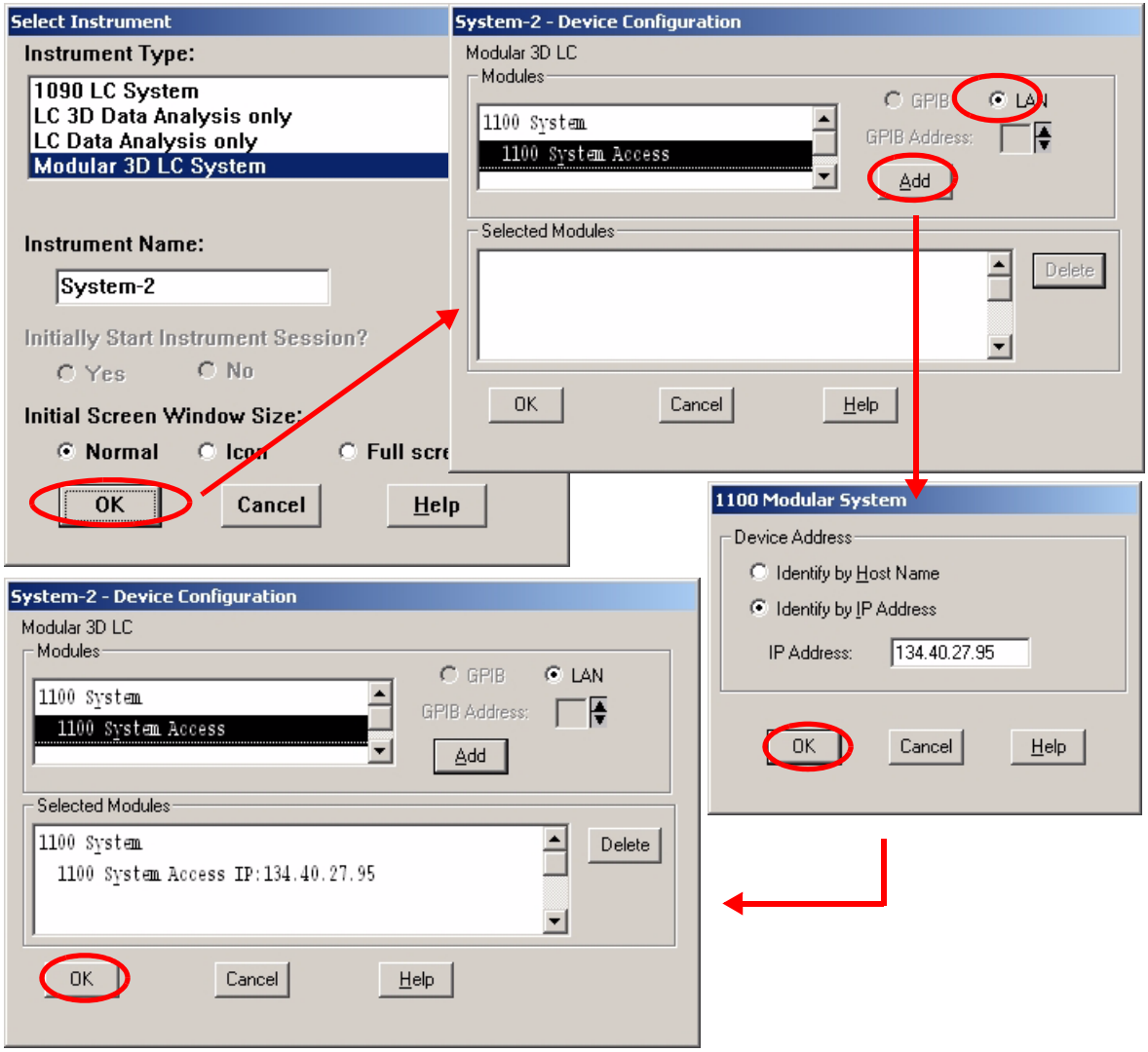


Figure 33 Changing the TCP/IP settings of the Agilent ChemStation

2 Add a TCP/IP connection to communicate with the detector. Use the IP address of the detector.

NOTE If using a corporate LAN, IP addresses need to be supplied by the responsible IT department. Also the LAN needs to be able to handle additional traffic.

3 Save the configuration, close the Configuration Editor and start the Agilent ChemStation.

4 LAN Configuration

5
Using the Detector

Setting up an Analysis 76
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Running the Sample and Verifying the Results 90
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Configuration Settings 92
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Optimizing the Detector 103
Special Setups with Multiple DAD/MWDs 104

This chapter provides information on how to set up the detector for an analysis and explains the basic settings.

Setting up an Analysis

This chapter can be used for

- preparing the system,
- to learn the set up of an HPLC analysis and
- to use it as an instrument check to demonstrate that all modules of the system are correctly installed and connected. It is not a test of the instrument performance.
- Learn about special settings

Before Using the System

Solvent Information

Observe recommendations on the use of solvents in chapter “Solvents” in the pump’s reference manual.

Priming and Purging the System

When the solvents have been exchanged or the pumping system has been turned off for a certain time (for example, overnight) oxygen will re-diffuse into the solvent channel between the solvent reservoir, vacuum degasser (when available in the system) and the pump. Solvents containing volatile ingredients will slightly lose these. Therefore priming of the pumping system is required before starting an application.

Table 10 Choice of Priming Solvents for Different Purposes

Activity	Solvent	Comments
After an installation	Isopropanol	Best solvent to flush air out of the system
When switching between reverse phase and normal phase (both times)	Isopropanol	Best solvent to flush air out of the system
After an installation	Ethanol or Methanol	Alternative to Isopropanol (second choice) if no Isopropanol is available
To clean the system when using buffers	Bidistilled water	Best solvent to re-dissolve buffer crystals
After a solvent change	Bidistilled water	Best solvent to re-dissolve buffer crystals
After the installation of normal phase seals (P/N 0905-1420)	Hexane + 5% Isopropanol	Good wetting properties

NOTE The pump should never be used for priming empty tubings (never let the pump run dry). Use a syringe to draw enough solvent for completely filling the tubings to the pump inlet before continuing to prime with the pump.

1 Open the purge valve of your pump (by turning it counterclockwise) and set flow rate to 3-5 ml/min.

2 Flush all tubes with at least 30 ml of solvent.

3 Set flow to required value of your application and close the purge valve.

Pump for approximately 10 minutes before starting your application.

Requirements and Conditions

What You Will Need

Table 11 lists the items you need to have for the set up of the analysis. Some of these are optional (not required for the basic system).

Table 11 What you will need

1200 system	Pump (plus degassing)
	Autosampler
	Detector, standard flow cell installed
	• Agilent ChemStation or • Instant Pilot G4208 (optional for basic operation) or • Control Module G1323B (optional for basic operation) with with the appropriate revisions, see "Performance Specifications" on page 30.
	System should be correctly set up for LAN communication with the Agilent ChemStation
Column:	Zorbax Eclipse XDB-C18, 4.6 x 150 mm, 5 um Part No. 993967-902 or Part No. 5063-6600
Standard:	Part No. 01080-68704 0.15 wt.% dimethylphthalate, 0.15 wt.% diethylphthalate, 0.01 wt.% biphenyl, 0.03 wt.% o-terphenyl in methanol

Conditions

A single injection of the isocratic test standard is made under the conditions given in Table 12:

Table 12 Conditions

Flow	1.5 ml/minute
Stoptime	8 minutes
Solvent	100% (30% water/70% Acetonitrile)
Temperature	Ambient
Wavelength	sample 254 nm (4 nm bandwidth) reference 360 nm (100 nm bandwidth)
Injection Volume	1 µl

Typical Chromatogram

A typical chromatogram for this analysis is shown in Figure 34. The exact profile of the chromatogram will depend on the chromatographic conditions. Variations in solvent quality, column packing, standard concentration and column temperature will all have a potential effect on peak retention and response.

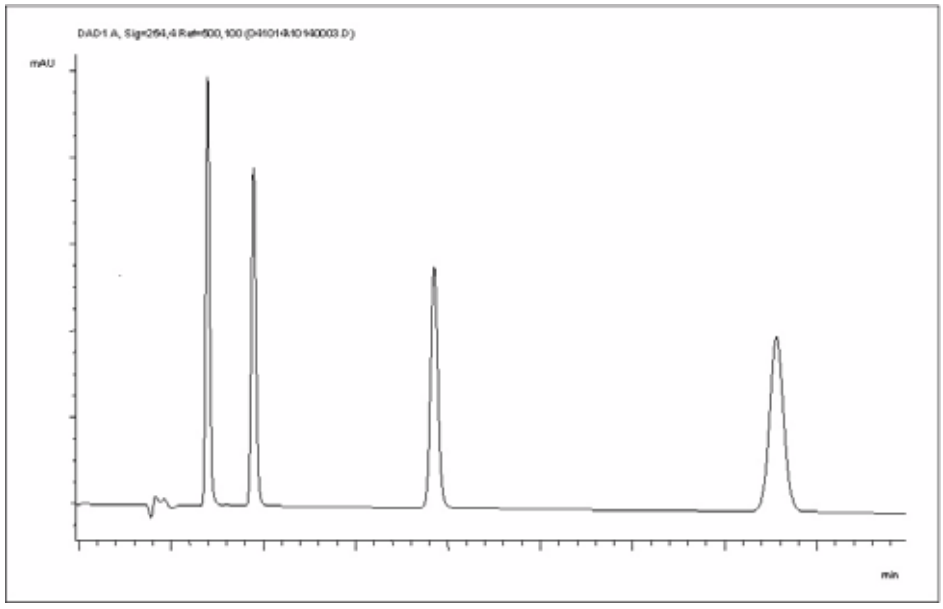


Figure 34 Typical Chromatogram with UV-detector

Optimization of the System

The settings used for this analysis are specific for this purpose. For other applications the system can be optimized in various ways. Please refer to the section "Optimizing the Detector" on page 103 or "*Optimizing*" in the your *module's Reference Manual.*

Preparing the HPLC System

1 Turn on the Agilent ChemStation PC and the monitor.

2 Turn on the 1200 series HPLC modules.

3 Start the Agilent ChemStation software. If the pump, autosampler, thermostatted column compartment and detector are found, the ChemStation screen should look like shown in Figure 35.

The System status is red (Not Ready).

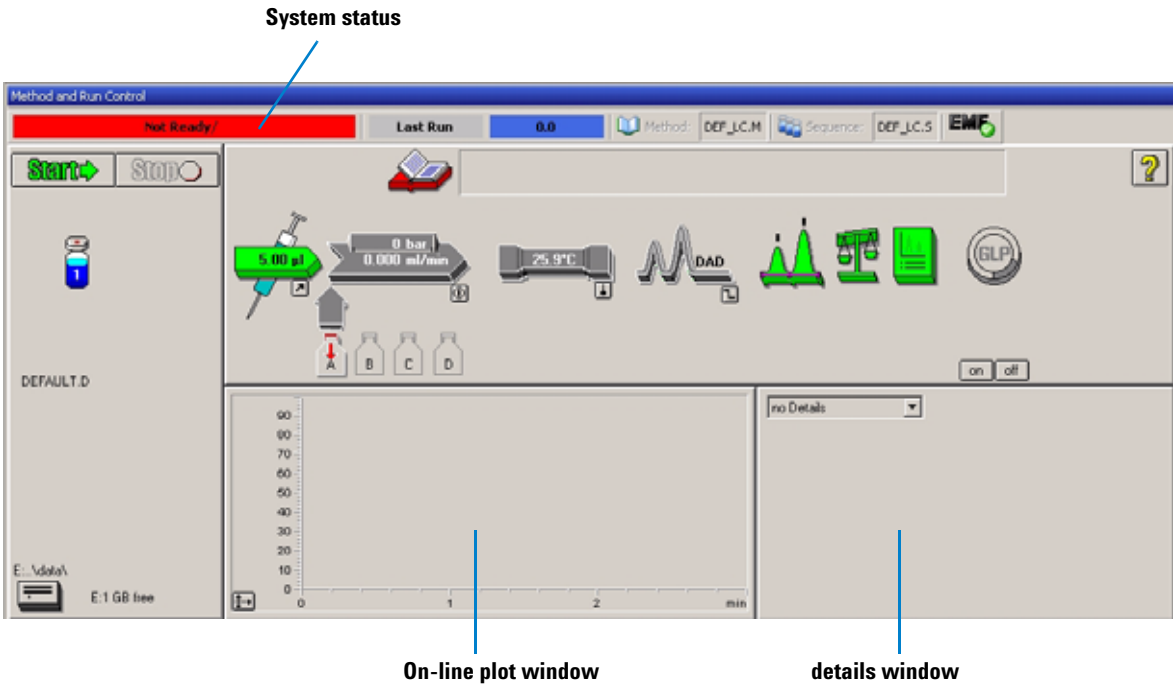


Figure 35 Initial ChemStation screen (Method and Run Control)

4 Turn on the detector lamp, pump and autosampler by clicking the *System On* button or the buttons below the module icons on the graphical user interface (GUI). After some time, the pump, thermostatted column compartment and detector module will turn to green.

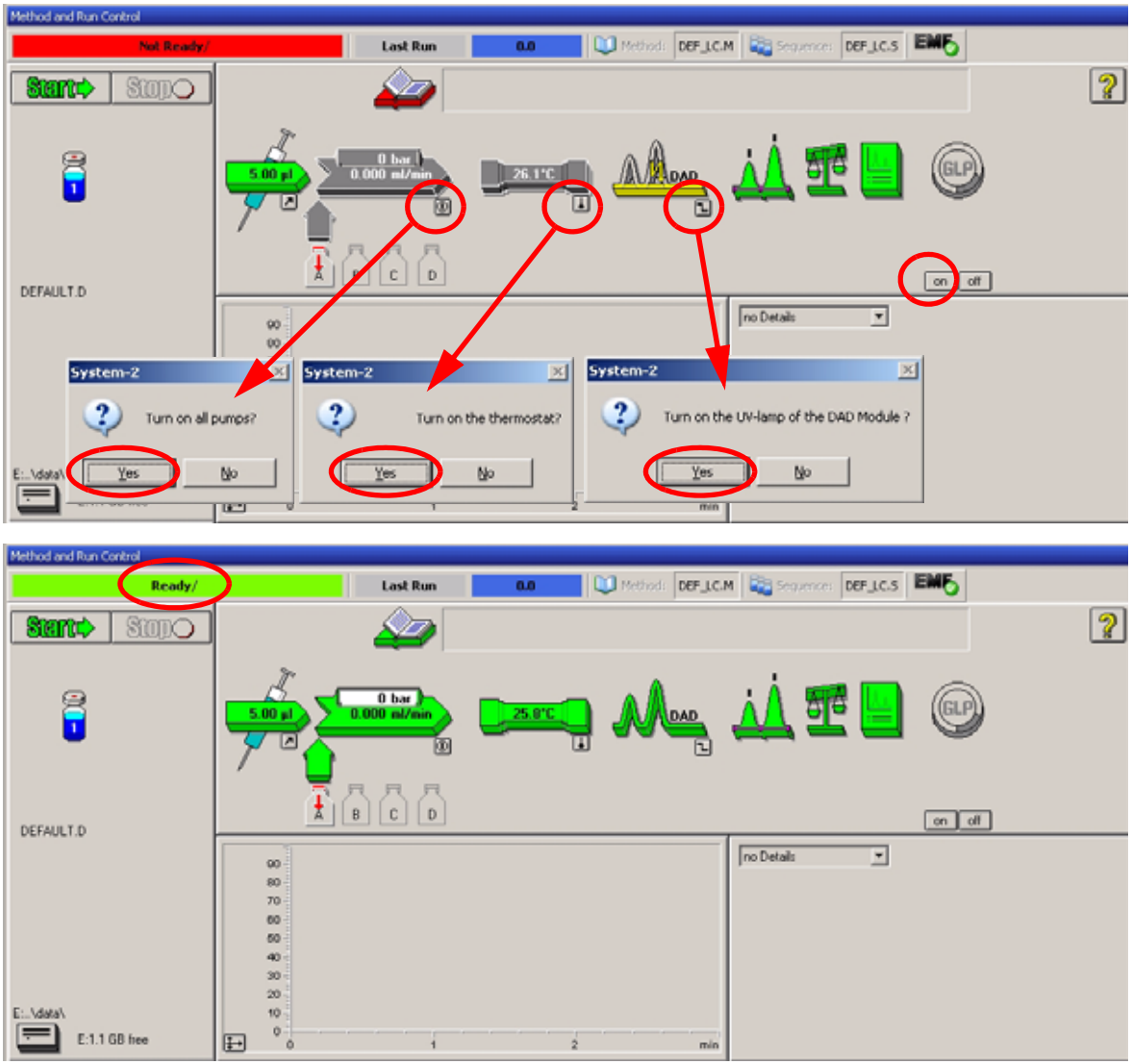


Figure 36 Turning on the HPLC Module

5 Purge the pump. For more information see "Priming and Purging the System" on page 76.

6 Allow the detector to warm up of at least 60 minutes to provide a stable baseline (see example in Figure 37 and Table 13).

NOTE

For reproducible chromatography, the detector and lamp should be on for at least one hour. Otherwise the detector baseline may still drift (depending on the environment). See also section "Wander / Drift Problems Due to Temperature Changes" on page 190.

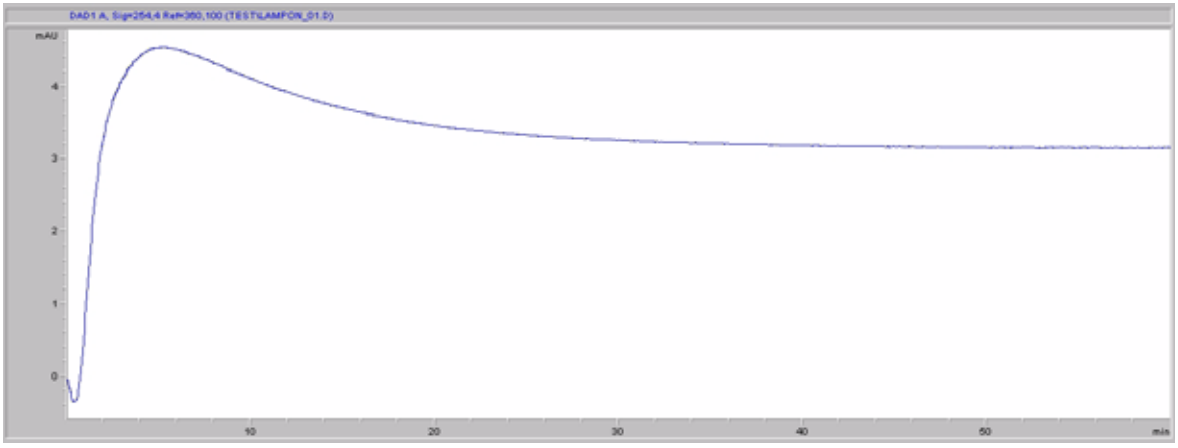


Figure 37 Stabilization of Baseline (both lamps turned on at the same time)

Table 13 Baseline drift after lamp turn on (example from Figure 37)

Time [minutes]	Drift [mAU/hr]
17 - 20	2.6
27 - 30	0.8
37 - 40	0.4
47 - 50	0.2
57 - 60	< 0.2

7 For the isocratic pump, fill the solvent bottle with the mixture of HPLC-grade bi-distilled water (30 %) and acetonitrile (70 %). For binary- and quaternary pumps you can use separate bottles.

8 Click on the *Load Method* button and select DEF_LC.M and press *OK*. Alternative double-click on the method in the method window. The default LC method parameters are transferred into the 1200 modules.

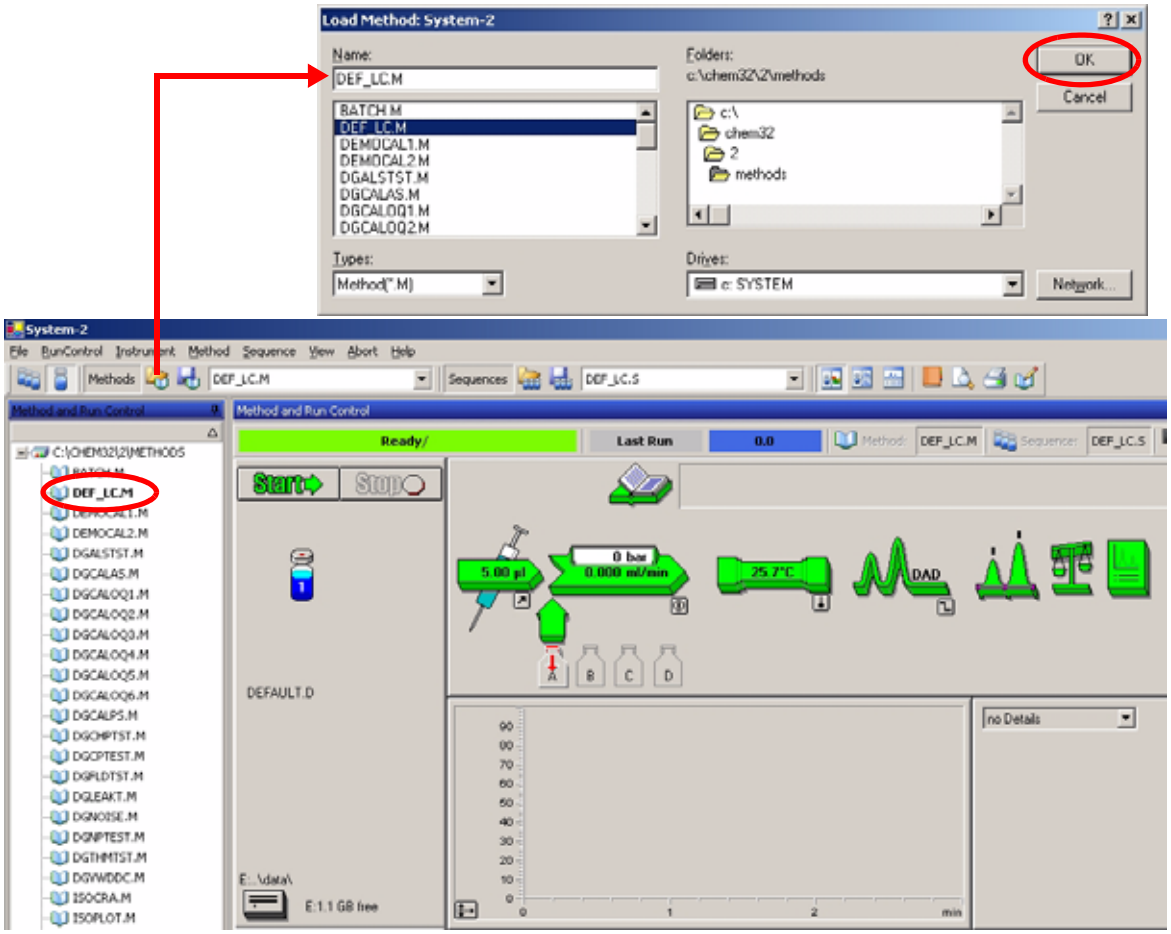


Figure 38 Loading Default LC Method

9 Click on the module icons (Figure 39) and open the *Setup* of these modules. Figure 40 on page 86 shows the detector settings (do not change the detector parameters at this time).

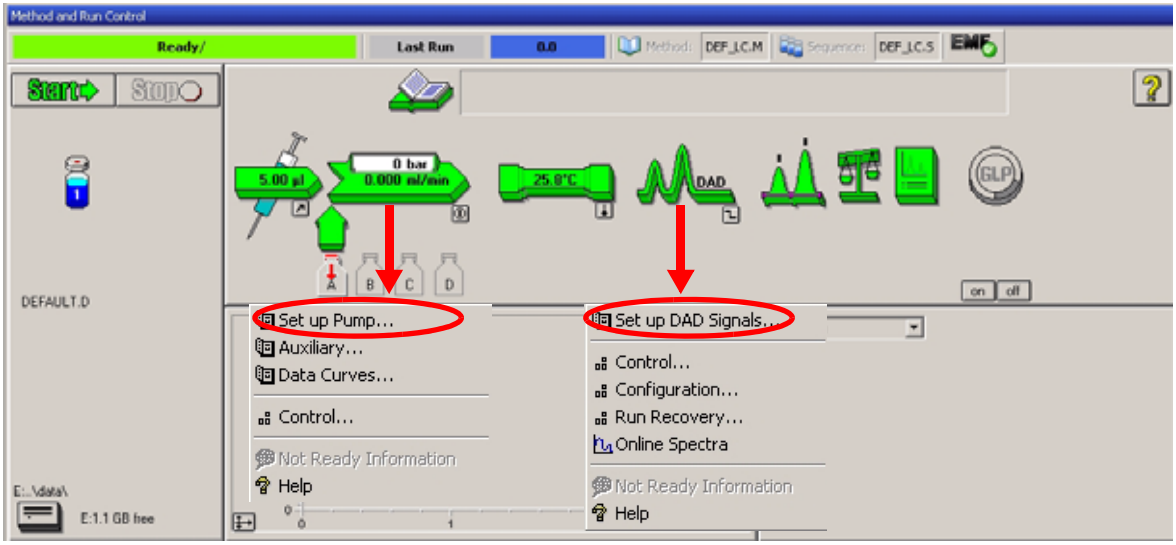
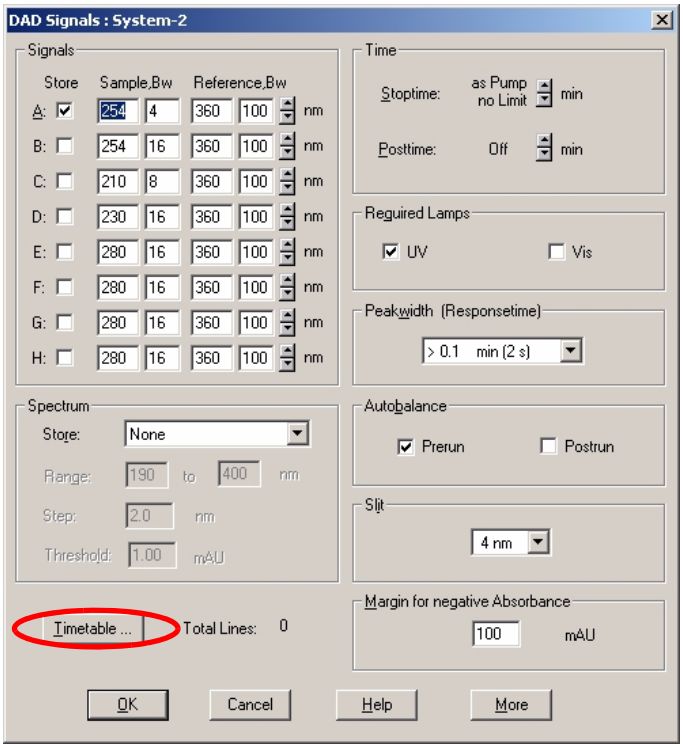
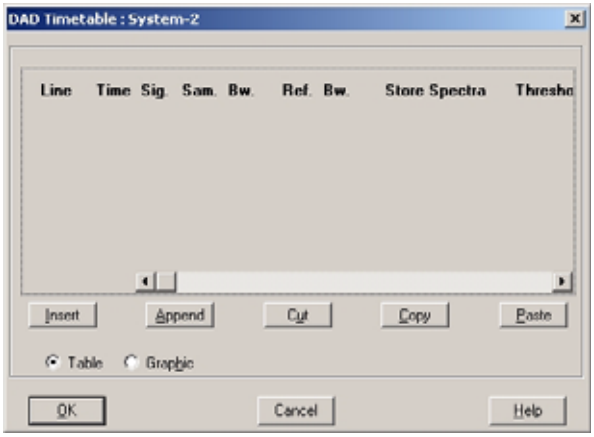


Figure 39 Open the module menu

10 Enter the pump parameters mentioned under "Conditions" on page 79.





- up to 8 signals (A to H) with individual wavelength settings can be selected.
- spectrum settings, see page 98.
- stop and post time can be set (if required)
- depending on the application, the lamps can be selected (one or both).
- peak width depends on the peaks in the chromatogram, see page 100.
- autobalance to zero absorbance (on the analog output plus offset) at begin and/or end of run.
- mechanical slit width can be changed for further optimization, see page 102.
- margin for negative absorbance, see page 103.
- Under **More** additional diagnostic signals can be added for troubleshooting purpose, see section "*Diagnostic Signals*" in the Service Manual.

- time table for programmable actions during the run.
  NOTE: The Agilent G1315C/D and G1365C/D time table can contain a maximum of 60 rows.

Figure 40 Detector parameter (default)

11 Pump the water/acetonitrile (30/70 %) mobile phase through the column for 10 minutes for equilibration.

12 Click the button and select *Change...* to open the Signal Plot information. Select the *Pump: Pressure* and the *DAD A: Signal 254,4* as signals. Change the Y-range for the DAD to 1 mAU and the offset to 20% and the pressure offset to 50%. The X-axis range should be 15 minutes. Press *OK* to exit this screen.

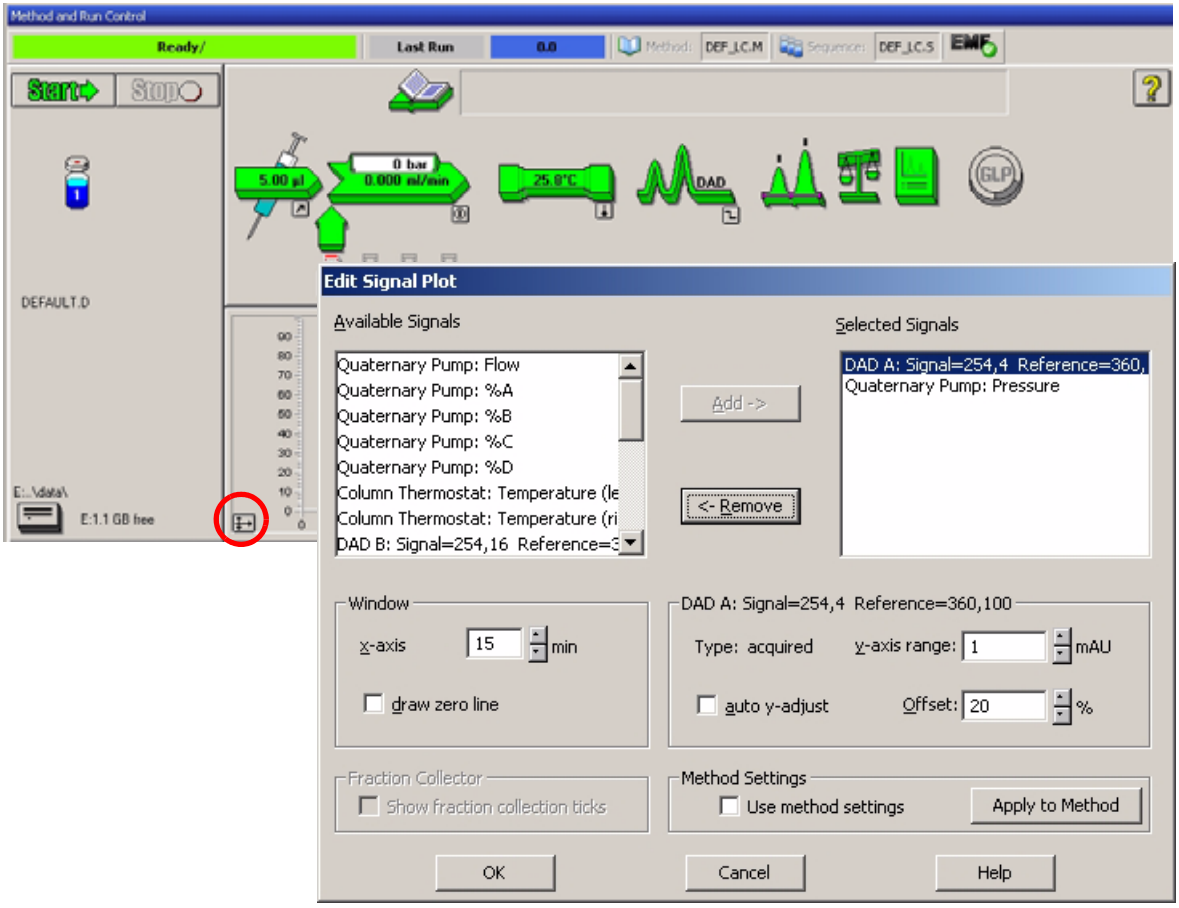


Figure 41 Edit Signal Plot Window

The Online Plot (Figure 42 on page 88) shows both, the pump pressure and the detector absorbance signals. Pressing *Adjust* the signals can be reset to the offset value and *Balance* would do a balance on the detector.

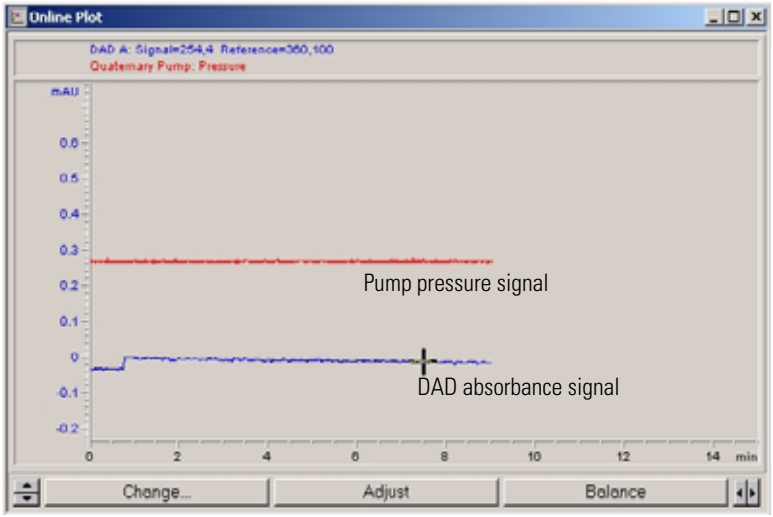


Figure 42 Online Plot Window

13 If both baselines are stable, set the Y-range for the detector signal to 100 mAU.

NOTE If you start with a new UV-lamp for the first time, the lamp may show initial drift for some time (burn-in effect).

14 Select the menu item *RunControl -> Sample Info* and enter information about this application (Figure 43 on page 89). Press *OK* to leave this screen.

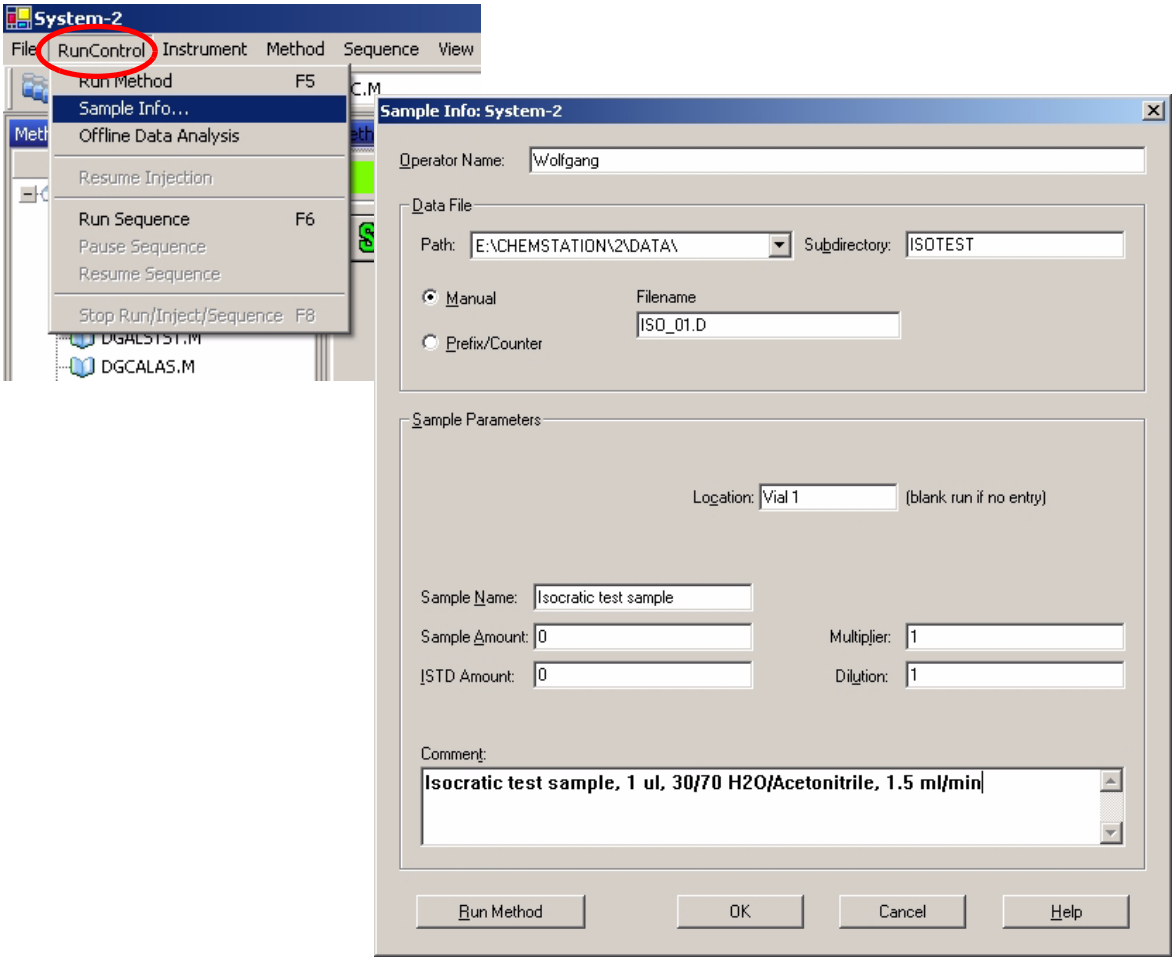


Figure 43 Sample Information

15 Fill the content of an isocratic standard sample ampoule into a vial and seal the vial with a cap and place the vial into autosampler tray (position #1).

Running the Sample and Verifying the Results

1 To start a run select the menu item *RunControl -> Run Method*.

2 This will start the 1200 modules and the online plot on the Agilent ChemStation will show the resulting chromatogram.

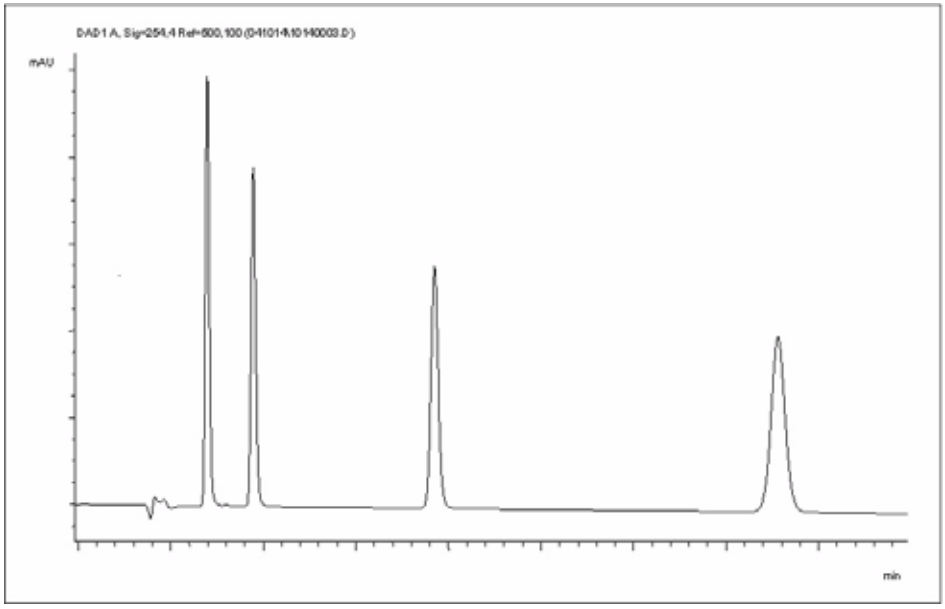


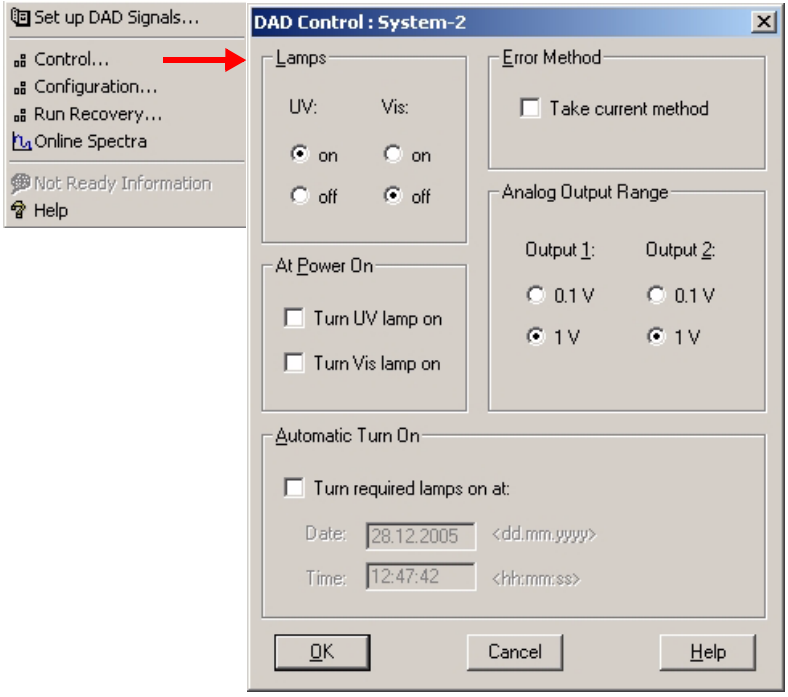
Figure 44 Chromatogram with Isocratic Test Sample

NOTE Information about using the Data Analysis functions can be obtained from the *Using your ChemStation* manual supplied with your system.

Special Settings of the Detector

In this chapter special settings of the G1315C/D and G1365C/D are described (based on the Agilent ChemStation B.02.01).

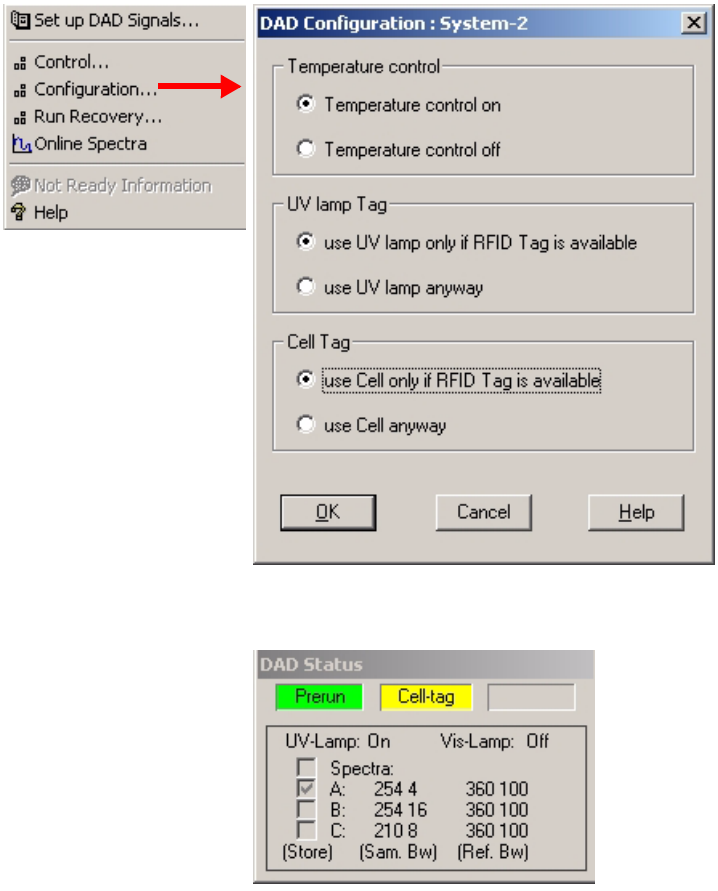
Control Settings



- **Lamps:** turn on and off of UV- and Vis lamp.
- **At Power On:** automatic lamp-on at power on.
- **Error Method:** take error method or current method (in case of an error).
- **Analog Output Range:** can be set to either 100 mV or 1 V full scale, see also "Analog Output Settings" on page 97.
- **Automatic Turn On:** lamps can be programmed (detector must be on for this).
- **Help:** online help.

Figure 45 Detector control settings

Configuration Settings



- **Temperature Control:** the optical unit is kept on constant temperature and improves the baseline stability in unstable environments. See also note below.
- **UV lamp tag:** for Agilent lamps with RFID tags. If no RFID tag lamp is used, detector icon will become grey (lamp tag not ready) and analysis is disabled.
- **Cell tag:** for Agilent flow cells with RFID tags. If no RFID tag cell is used, detector icon will become grey (cell tag not ready) and analysis is disabled.
- **Help:** online help.

The detector status shows “Cell-tag” in yellow in case the flow cell with the RFID tag is not inserted. The detector icon is gray and the system is not ready.

Figure 46 Detector configuration settings

NOTE If the flow cell temperature is critical for your chromatography, you may set the Temperature Control to off. This will lower the optical unit and flow cell temperature by some degree C. For more details see “Principle of Temperature Control” on page 192.

Online Spectra (DAD only)

1 To view the online spectra during the run select *Online Spectra*.

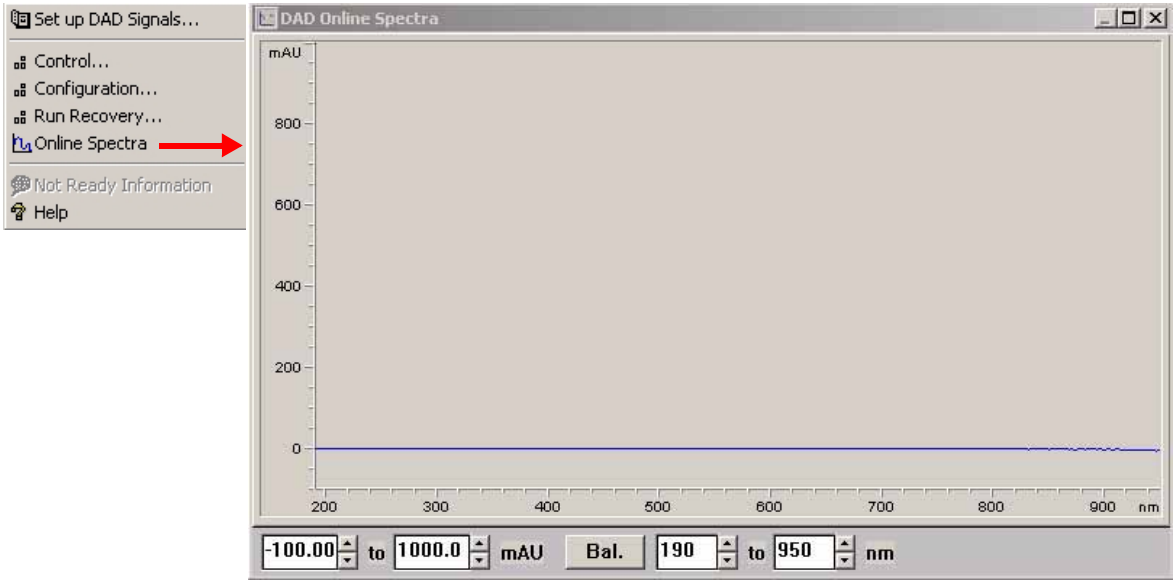


Figure 47 Online Spectra Window

2 Change the absorbance and wavelength range according your needs.

Run Recovery Settings (G1315C/G1365C only)

CAUTION For this recovery mode the CompactFlash Card must be in the detector. The detector's local memory is too small to store the data.

The detector supports run buffering, which means that an amount of run data (*.uv and *.ch files) is stored in a storage medium (CompactFlash Card) in the detector until either it is overwritten or the detector undergoes a power cycle.

If there is a temporary network failure or the PC is not able to constantly take the data, the stored data is transferred to the ChemStation automatically when the network connection is restored or the PC can take the data, so that no loss of data occurs.

If there is a permanent network failure, the Run Recovery dialog box (Figure 48 on page 96) allows you to restore the stored data to the data directory. From there you can copy the files to the directory where the files are corrupted or not complete.

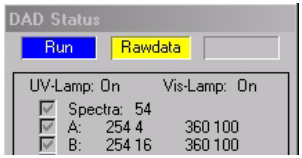
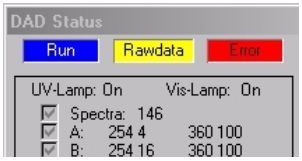
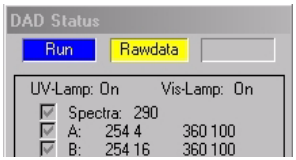
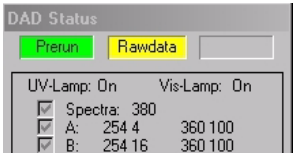
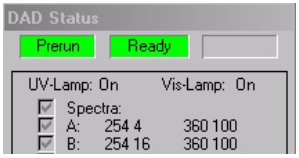
NOTE On very large recovery files it may take a long time to restore it to the Agilent ChemStation.

A sequence will be stopped in case of a network problem.

NOTE When during recovery an error "Method/Sequence stopped" appears, the instrument logbook shows an entry "No Run data available in device". In this case refer to "No Run Data Available In Device (G1315C/G1365C only)" on page 157.

Automated Run Recovery in case of temporary communication failures

Table 14 Automated Run Recovery in case of temporary communication failures

Situation	Reaction	On ChemStation
All OK	• Run in progress - Data Analysis • Run / Rawdata • Elapsed run time is running • Spectra counter is running • Data are stored on PC and on card	
LAN breaks	• Run in progress - Data Analysis • Run / Rawdata • Error Power Fail • Elapsed run time stops • Spectra counter stops • Data continues to be stored on card	
LAN recovers	• Run in progress - Data Analysis • Run / Rawdata • Error Power Fail cleared • Elapsed run time continues at actual time • Spectra counter continues • Data continues to be stored ion PC and on card • ChemStation tries already to add missing data (depends on the data load).	
Stop time elapsed	• Run in progress - Data Analysis • Prerun / Rawdata • Elapsed run time stops • Spectra counter continues • ChemStation continues to ads missing data	
Run ends	• Ready • Run finished • Prerun / Ready	

NOTE If the detector status window is not opened, you will realize only the Power Fail error and the long Run In Progress information until the data is recovered from disk.

Manual Run Recovery in case of permanent communication failures

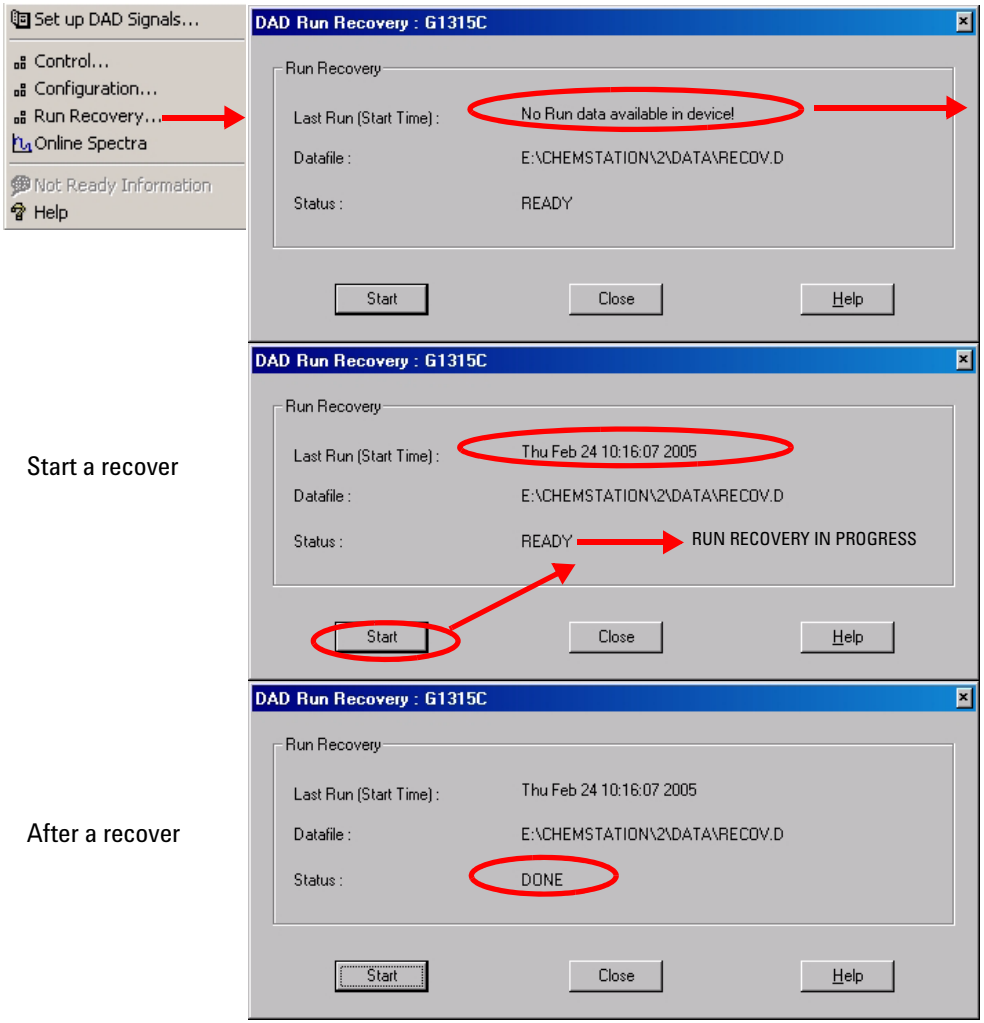


Figure 48 Manual Run Recovery in case of permanent communication failures

NOTE

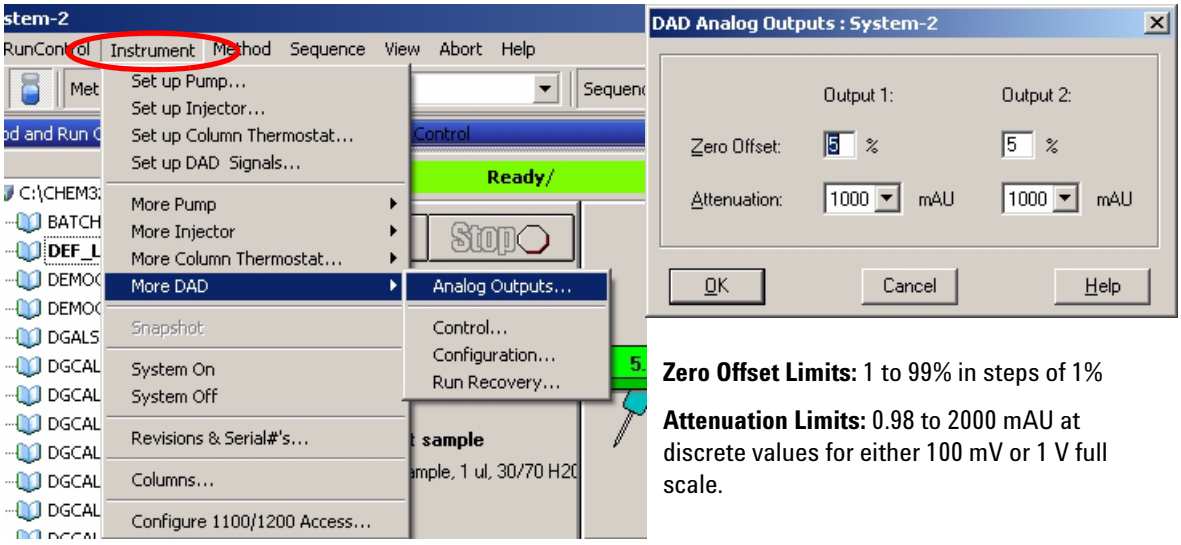
When during recovery an error "Method/Sequence stopped" appears, the instrument logbook shows an entry "No Run data available in device". In this case refer to "No Run Data Available In Device (G1315C/G1365C only)" on page 157.

Analog Output Settings

To change the Output Range of the analog outputs see “Control Settings” on page 91.

1 To change the offset and the attenuation select *Analog Outputs*.

2 Change the ranges for absorbance and wavelength according your needs.



Zero Offset Limits: 1 to 99% in steps of 1%

Attenuation Limits: 0.98 to 2000 mAU at discrete values for either 100 mV or 1 V full scale.

Figure 49 Analog Output Settings

3 Change the values if required.

Spectrum Settings (DAD only)

To change the Spectra settings open.

1. To change the Spectra settings select *Setup Detector Signals*.
2. In the section Spectrum click on the drop-down list and chose a parameter. Table 15 on page 99 shows the possible parameters.
3. Change the Range, Step width and Threshold according to your needs.

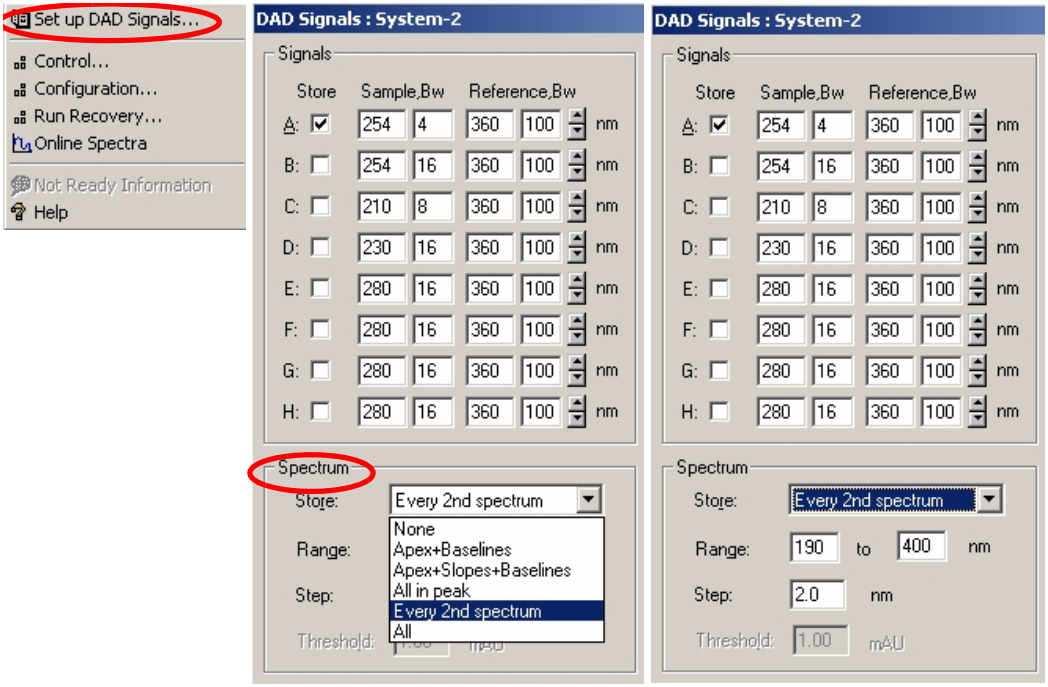


Figure 50 Spectra Settings

Table 15 Spectrum Settings

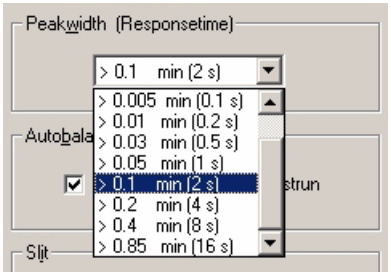
Store	Defines at which points on "signal A" spectra will be taken and saved. Signal A is used to control the "peak controlled spectra acquisition"; the other signals have no influence on spectra acquisition.
None	No spectra are taken.
Apex + Baselines	Spectra are taken at the apex and baselines of the peak.
Apex + Slopes + Baselines	Spectra are taken at the apex, baselines, upslope, and downslope of the peak.
All in Peak	All spectra within the peak are taken.
NOTE	The three spectra acquisition types mentioned above are also referred to as peak-controlled spectra acquisition. The peak detection is done by the detector firmware based on the threshold and peakwidth parameters you set for the DAD. If you want to use peak-controlled spectra storage, make sure that you set these parameters to recognize all the peaks of interest. The integration algorithm also includes peak detection based on the threshold and peakwidth parameters set in the integration events.
Every 2nd spectrum	Spectra are taken continuously as for All, but only every second spectrum is stored; other spectra are discarded. This reduces the amount of data storage necessary.
All	Spectra are taken continuously depending on the setting of the Peakwidth. Eight spectra are acquired per Peakwidth. The acquisition time for one spectrum is slightly less than the Peakwidth divided by 8, that is, greater than or equal to 0.01s and less than or equal to 2.55s.
NOTE	If there are no peaks in Signal A, there are no spectra. You cannot process spectra present in other signals.
Range	Range defines the wavelength range for spectral storage. Limits: 190 to 950 nm in steps of 1 nm for both low and high values. The high value must be greater than the low value by at least 2 nm.
Step	Step defines the wavelength resolution for spectral storage. Limits: 0.10 to 100.00 nm in steps of 0.1 nm.
Threshold:	The threshold is the height in mAU of the smallest expected peak. The peak detector ignores any peaks which are lower than the threshold value and does not save spectra. Limits: 0.001 to 1000.00 mAU in steps of 0.001 mAU. Usable for modes Apex + Baselines, Apex + Slopes + Baselines and All in Peak

Peakwidth Settings

NOTE

- Do not use peak width shorter than necessary
- Do not use 0.025 sec response time (no filtering/high noise and no need (actually ultra-fast LC doesn't deliver peaks < 0.0025 min / < 0.15 sec))

1 To change the Peakwidth settings select *Setup Detector Signals*.
2 In the section Peakwidth (Responsetime) click on the drop-down list.
3 Change the Peakwidth according to your needs.



Peakwidth enables you to select the peak width (response time) for your analysis. The peak width is defined as the width of a peak, in minutes, at half the peak height. Set the peak width to the narrowest expected peak in your chromatogram. The peak width sets the optimum response time for your detector. The peak detector ignores any peaks that are considerably narrower, or wider, than the peak width setting. The response time is the time between 10% and 90% of the output signal in response to an input step function. When the All spectrum storage option is selected, then spectra are acquired continuously depending on the setting of the peak width. The time specified by the peak width is used as a factor in the acquisition of spectra. The acquisition time for one spectrum is slightly less than the peak width divided by 8, that is the acquisition time is between 0.0125 seconds (80 Hz) and 3.2 seconds.

Limits: When you set the peak width (in minutes), the corresponding response time is set automatically and the appropriate data rate for signal and spectra acquisition is selected as shown in Table 16 on page 101.

Figure 51 Peakwidth Setting

Table 16 Peak Width — Response Time — Data Rate

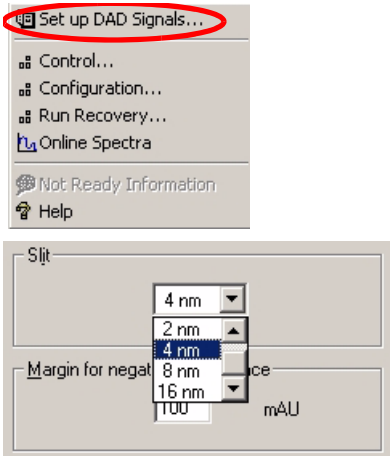
Peak Width (min)	Response Time (sec)	Data Rate (Hz)	Detector
<0.0025	0.025	80	G1315C/G1365C only
>0.0025	0.05	80	G1315C/G1365C only
>0.005	0.1	40	G1315C/G1365C only
>0.01	0.2	20	G1315C/D and G1365C/D
>0.03	0.5	10	G1315C/D and G1365C/D
>0.05	1.0	5	G1315C/D and G1365C/D
>0.10	2.0	2.5	G1315C/D and G1365C/D
>0.20	4.0	1.25	G1315C/D and G1365C/D
>0.40	8.0	0.62	G1315C/D and G1365C/D
>0.85	16.0	0.31	G1315C/D and G1365C/D

Slit Settings

1 To change the Slit settings select *Setup Detector Signals*.

2 In the section Slit click on the drop-down list.

3 Change the Slit width according to your needs.



The Slit group allows you to select the optical bandwidth of the detector; the narrower the slit, the smaller the optical bandwidth of the instrument, but the lower its sensitivity. The smaller the optical bandwidth the higher the spectral resolution.

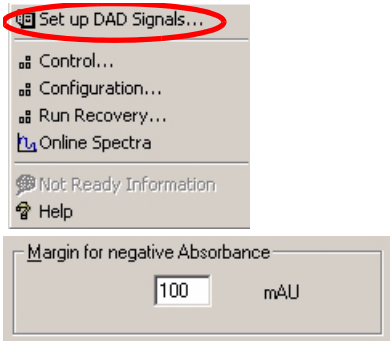
To set the slit width, display the drop-down list and select an appropriate slit width from the list.

Figure 52 Slit Settings

Margin for Negative Absorbance Settings

1 To change the settings select *Setup Detector Signals*.

2 In the section Margin for Negative Absorbance change the value according to your needs.



Use this field to modify the detector's signal handling to increase the margin for negative absorbance. Use this option if, for example, your solvent gradient produces a decreasing baseline absorbance, and for GPC analyses.

Limits: 100 to 4000 mAU.

Figure 53 Margin for Negative Absorbance

NOTE The higher the value the greater the baseline noise. Set this value only if you expect negative absorbance greater than -100 mAU.

Optimizing the Detector

Additional theoretical information can be found in chapter "How to optimize the Detector" on page 105:

Special Setups with Multiple DAD/MWDs

NOTE

The G1315C/D and G1365C/D detectors are based on the same new hardware/electronic platform.

The G1315A/B and G1365A/B detectors are based on the old hardware/electronic platform.

Two detectors of same type (e.g. G1315C/D and G1315C/D)

If you have two G1315C/D DAD or G1365C/D MWD in the same system then you can rearrange the order in the menu *Instrument - Configure 1200 Access* to assign a specific detector as detector 1 and 2.

NOTE

The diagnostics, tests and OQ/PV should be done with only one detector configured.

Two detectors of similar type (e.g. G1315C/D and G1315A/B)

If you have similar detectors in the same system, the G1315C/D will be automatically always detector 2 while the G1315A/B is detector 1 independent from its location in the stack. This cannot be changed.

6
How to optimize the Detector

Optimizing the Detector Performance 106
Optimization Overview 107
Optimizing for Sensitivity, Selectivity, Linearity and Dispersion 109
Optimizing Selectivity 120

This chapter provides information on how to optimize the detector.

Optimizing the Detector Performance

The detector has a variety of parameters that can be used to optimize performance. Depending on whether signal or spectral data need to be optimized, different settings are recommended. The following sections describe optimization for:

- signal sensitivity, selectivity and linearity,
- spectral sensitivity and resolution (DAD only), and
- disk space required for storing data.

NOTE The information in this chapter should be seen as a basic introduction to diode array detector technics. Some of these technics may not be available in the instrument firmware or the user interfaces (Control Module and/or Agilent Chemstation).

How to Get the Best Detector Performance

The information below will guide you on how to get the best detector performance. Follow these rules as a start for new applications. It gives rules-of-thumb for optimizing detector parameters.

Optimization Overview

Table 17 Optimization Overview

Parameter	Impact
1 Selection of flow cell • Choose flow cell according to used column, see Figure 54.	• peak resolution versus sensitivity
2 Connection of flow cell • For flow rates from 0.5 ml/min connect column using the zero-dead-volume fittings of the detector. • For small column i.d. (e.g 1 mm) the inlet capillary of the micro flow cell can be connected directly to the column.	• chromatographic resolution
3 Setting the peak width (response time) • Use peak width according Figure 54 as starting point. • Set the peak-width close to the width of a narrow peak of interest in your chromatogram.	• peak resolution versus sensitivity versus disk space
4 Setting wavelength and bandwidth • Sample wavelength:	
• Never miss a peak by the use of a browser wavelength like 250 nm with 100 nm bandwidth.	• sensitivity versus selectivity
• Select specific wavelength with reduced bandwidth if you need selectivity, e.g. 250,10 nm and 360,100 nm as reference wavelength.	
• Set the sample wavelength to a peak or valley in the spectrum to get best linearity for high concentrations.	• sensitivity versus linearity
• Reference wavelength:	
• Select the reference wavelength with broad bandwidth (30...100 nm) wavelength range where your analytes have little or no absorbance (e.g. sample at 254 nm, reference at 320 nm).	• baseline drift due to RI effects.

Table 17 Optimization Overview, continued

Parameter	Impact
5 Setting the slit width • Use 4 nm slit for normal applications. • Use narrow slit (e.g 1 nm) if your analytes have narrow absorbance bands and for high concentrations. • Use a wide slit (e.g. 16 nm) to detect very low concentrations. • Optimizing spectral acquisition (DAD only) • Select spectra acquisition mode according to your needs (see "Spectrum Settings" on page 99). • Set the spectral wavelength range (for colorless samples 190...400 nm is sufficient). • Set step to 4 nm for normal use; set small step (and slit width) if high resolution of spectra with fine structure is wanted.	• spectral resolution, sensitivity and linearity.

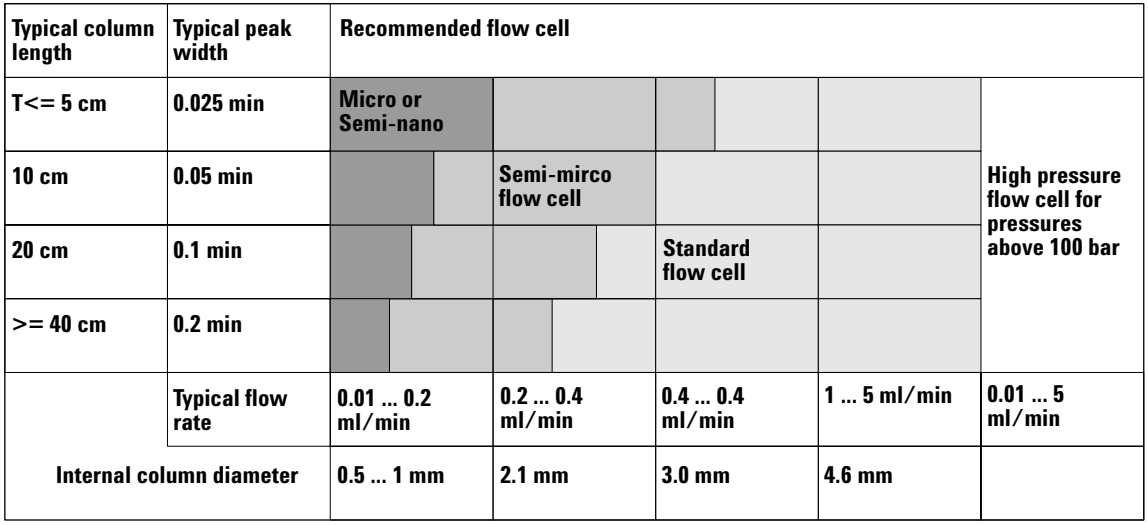


Figure 54 Choosing a Flow Cell in HPLC

Optimizing for Sensitivity, Selectivity, Linearity and Dispersion

Flow Cell Path Length

Lambert-Beer's law shows a linear relationship between the flow cell path length and absorbance.

$$Absorbance = -\log T = \log\frac{I_0}{I} = \varepsilon \cdot C \cdot d$$

where

T is the transmission, defined as the quotient of the intensity of the transmitted light I divided by the intensity of the incident light, I_0,

ε is the extinction coefficient, which is a characteristic of a given substance under a precisely-defined set of conditions of wavelength, solvent, temperature and other parameters,

C is the concentration of the absorbing species (usually in g/l or mg/l), and

d is the path length of the cell used for the measurement.

Therefore, flow cells with longer path lengths yield higher signals. Although noise usually increases little with increasing path length, there is a gain in signal-to-noise ratio. For example, in Figure 55 the noise increased by less than 10 % but a 70 % increase in signal intensity was achieved by increasing the path length from 6 mm to 10 mm.

When increasing the path length, the cell volume usually increases — in our example from 5 – 13 µl. Typically, this causes more peak dispersion. As Figure 55 demonstrates, this did not affect the resolution in the gradient separation in our example.

As a rule-of-thumb the flow cell volume should be about 1/3 of the peak volume at half height. To determine the volume of your peaks, take the peak width as reported in the integration results multiply it by the flow rate and divide it by 3).

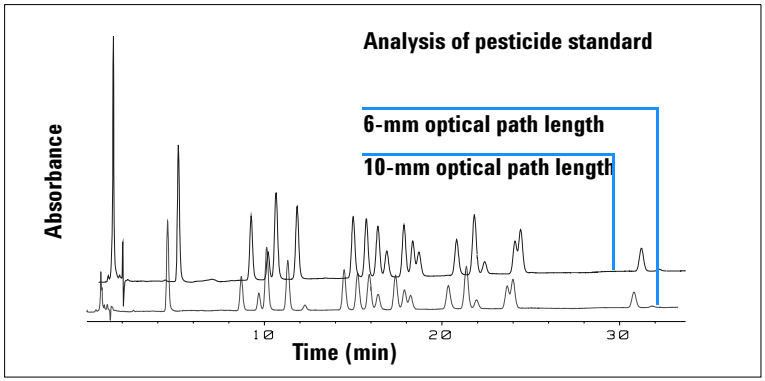


Figure 55 Influence of Cell Path Length on Signal Height

Traditionally LC analysis with UV detectors is based on comparing measurements with internal or external standards. To check photometric accuracy of the Agilent 1200 DAD/MWD it is necessary to have more precise information on path lengths of the flow cells.

The correct response is:

```
expected response * correction factor
```

Please find below the details of the Agilent 1200 DAD/MWD flow cells:

Table 18 Correction factors for Agilent 1200 DAD/MWD flow cells

Flow cell type	Cell volume	Part number	Path length (nominal)	Path length (actual)	Correction factor
Standard flow cell	13 µl	G1315-60022	10 mm	9.80 ± 0.07 mm	10/9.8
Semi-micro flow cell	5 µl	G1315-60025	6 mm	5.80 ± 0.07 mm	6/5.8
Micro flow cell	2 µl	G1315-60024	3 mm	3.00 + 0.05 mm / -0.07 mm	3/3
500 Nanoliter flow cell kit	0.5 µl	G1315-68724	10 mm	10.00 ± 0.02 mm	10/10
80 Nanoliter flow cell kit	0.08 µl	G1315-68716	6 mm	6.00 ± 0.02 mm	6/6
High Pressure flow cell	1.7 µl	G1315-60015	6 mm	5.75 ± 0.07 mm	6/5.75

Peak width (response time)

Response time describes how fast the detector signal follows a sudden change of absorbance in the flow cell. The detector uses digital filters to adapt response time to the width of the peaks in your chromatogram. These filters do not affect peak area nor peak symmetry. When set correctly, such filters reduce baseline noise significantly (see Figure 56), but reduce peak height only slightly. In addition, these filters reduce the data rate to allow optimum integration and display of your peaks and to minimize disk space required to store chromatograms and spectra.

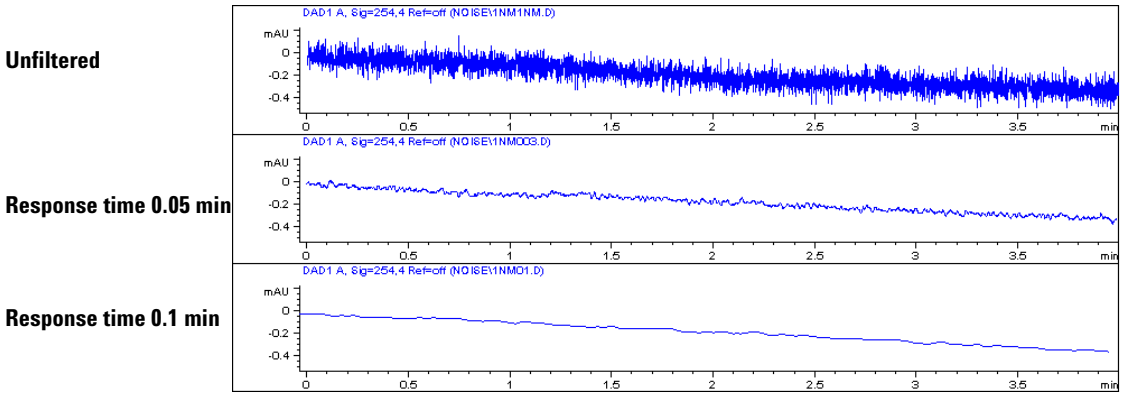


Figure 56 Influence of Response Time on Signal and Noise

Figure 19 lists the filter choices of the detector. To get optimum results, set peak width as close as possible to a narrow peak of interest in your chromatogram. Response time will the be approximately 1/3 of the peak width, resulting in less than 5 % peak-height reduction and less than 5 % additional peak dispersion. Decreasing the peak width setting in the detector will result in less than 5 % gain in peak height but baseline noise will increase by a factor of 1.4 for a factor of 2 response-time reduction. Increasing peak width (response time) by factor of two from the recommended setting (over-filtering) will reduce peak height by about 20 % and reduce baseline noise by a factor of 1.4. This gives you the best possible signal-to-noise ratio, but may affect peak resolution.

Table 19 Peak Width — Response Time — Data Rate

Peak Width (min)	Response Time (sec)	Data Rate (Hz)	Detector
<0.0025	0.025	80	G1315C/G1365C only
>0.0025	0.05	80	G1315C/G1365C only
>0.005	0.1	40	G1315C/G1365C only
>0.01	0.2	20	G1315C/D and G1365C/D
>0.03	0.5	10	G1315C/D and G1365C/D
>0.05	1.0	5	G1315C/D and G1365C/D
>0.10	2.0	2.5	G1315C/D and G1365C/D
>0.20	4.0	1.25	G1315C/D and G1365C/D
>0.40	8.0	0.62	G1315C/D and G1365C/D
>0.85	16.0	0.31	G1315C/D and G1365C/D

Sample and Reference Wavelength and Bandwidth

The detector measures absorbance simultaneously at wavelengths from 190 to 950 nm. Two lamps provide good sensitivity over the whole wavelength range. The deuterium discharge lamp provides the energy for the UV range (190 to 400 nm) and the tungsten lamp emits light from 400 to 950 nm for the visible and short wave near infrared.

If you know little about the analytes in your sample, use both lamps and store all spectra over the full wavelength range. This provides full information but fills up your disk space rather quickly. Spectra can be used to check a peak's purity and identity. Spectral information is also useful to optimize wavelength settings for your chromatographic signal.

The detector can compute and store at run time up to 8 signals with these properties:

- sample wavelength, the center of a wavelength band with the width of sample bandwidth (BW), and optionally
- reference wavelength, the center of a wavelength band with the width of reference bandwidth.

The signals comprises a series of data points over time, with the average absorbance in the sample wavelength band minus the average absorbance of the reference wavelength band.

Signal A in the detector default method is set to sample 250,100, reference 360,100, that is, the average absorbance from 200 – 300 nm minus the average absorbance from 300 – 400 nm. As all analytes show higher absorbance at 200 – 300 nm than at 300 – 400 nm, this signal will show you virtually every compound which can be detected by UV absorbance.

Many compounds show absorbance bands in the spectrum. Figure 57 shows the spectrum of anisic acid as an example.

To optimize for lowest possible detectable concentrations of anisic acid, set the sample wavelength to the peak of the absorbance band (that is, 252 nm) and the sample bandwidth to the width of the absorbance band (that is, 30 nm). A reference of 360,100 is adequate. Anisic acid does not absorb in this range.

If you work with high concentrations, you may get better linearity above 1.5 AU by setting the sample wavelength to a valley in the spectrum, like 225 nm for anisic acid.

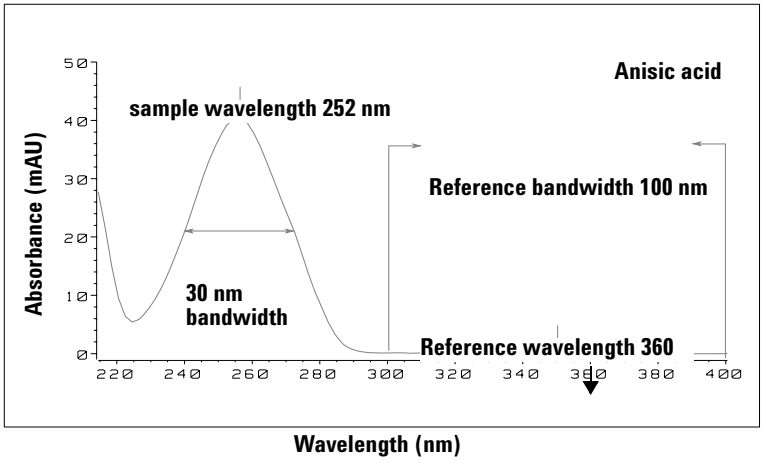


Figure 57 Optimization of Wavelength Setting

A wide bandwidth has the advantage of reducing noise by averaging over a wavelength range – compared to a 4 nm bandwidth, the baseline noise is reduced by a factor of approximately 2.5, whereas the signal is about 75 % of a 4-nm wide band. The signal-to-noise ratio for a 30 nm bandwidth is twice that for a 4-nm bandwidth in our example.

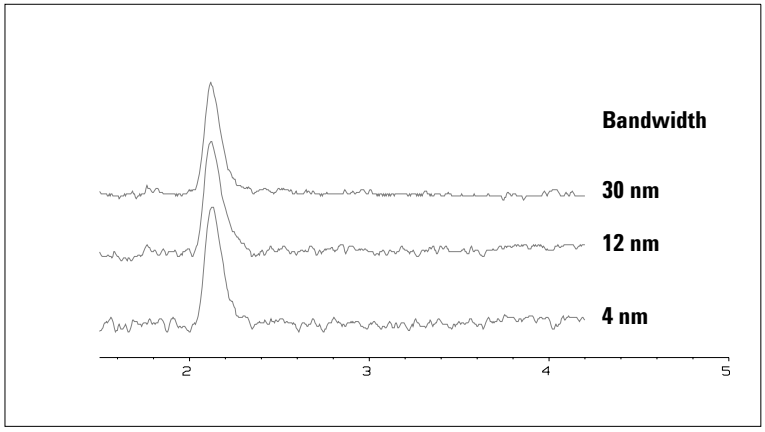


Figure 58 Influence of Bandwidth on Signal and Noise

Because the detector averages absorbance values that are calculated for each wavelength, using a wide bandwidth does not negatively impact linearity.

The use of a reference wavelength is highly recommended to further reduce baseline drift and wander induced by room temperature fluctuations or refractive index changes during a gradient.

An example of the reduction of baseline drifts is shown in Figure 59 for PTH-amino acids. Without a reference wavelength, the chromatogram drifts downwards due to refractive index changes induced by the gradient. This is almost completely eliminated by using a reference wavelength. With this technique, PTH-amino acids can be quantified in the low picomole range even in a gradient analysis.

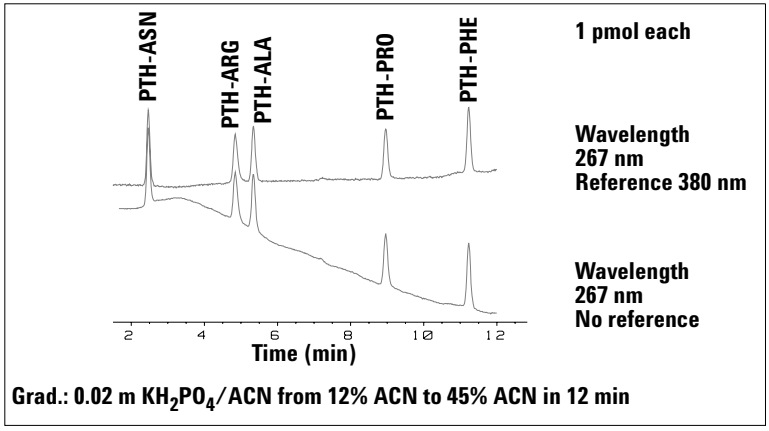


Figure 59 Gradient Analysis of PTH-Amino Acids (1 pmol each), with and without Reference

Slit Width

The detector has a variable slit at the entrance of the spectrograph. This is an effective tool to adapt the detector to changing demand of different analytical problems.

A narrow slit provides spectral resolution for analytes with very fine structures in the absorbance spectrum. An example of such a spectrum is benzene. The five main absorbance bands (fingers) are only 2.5 nm wide and just 6 nm apart from each other.

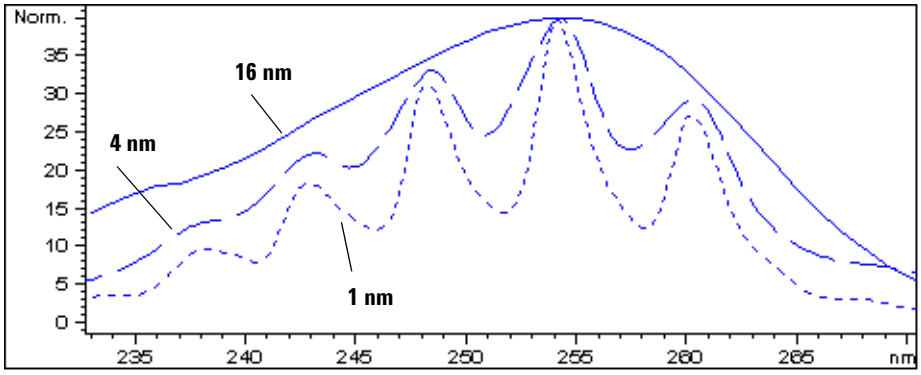


Figure 60 Benzene at 1, 4 and 16 nm slit width

A wide slit uses more of the light shining through the flow cell. This gives lower baseline noise as shown in Figure 61.

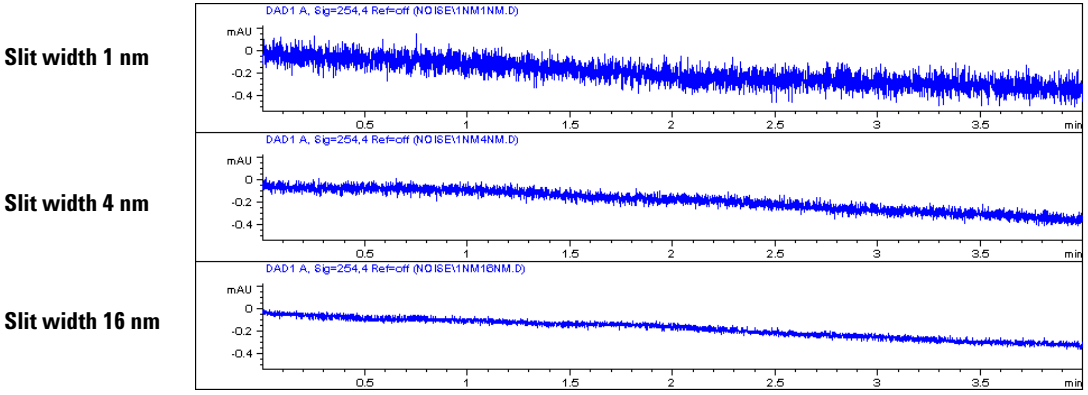


Figure 61 Influence of the Slit Width on Baseline Noise

However, with a wider slit, the spectrograph's optical resolution (its ability to distinguish between different wavelengths) diminishes. Any photodiode receives light within a range of wavelength determined by the slit width. This explains why the fine spectral structure of benzene disappears when using a 16-nm wide slit.

Furthermore, the absorbance is no longer strictly linear with concentration for wavelengths at a steep slope of a compound's spectrum.

Substances with fine structures and steep slopes like benzene are very rare.

In most cases the width of absorbance bands in the spectrum is more like 30 nm as with anisic acid (see Figure 57).

In most situations, a slit width of 4 nm will give the best results.

Use a narrow slit (1 or 2 nm) if you want to identify compounds with fine spectral structures or if you need to quantify at high concentrations (> 1000 mAU) with a wavelength at the slope of the spectrum. Signals with a wide bandwidth can be used to reduce baseline noise. Because (digital) bandwidth is computed as average of absorbance, there is no impact on linearity.

Use a wide (8 or 16 nm) slit when your sample contains very small concentrations. Always use signals with bandwidth at least as wide as the slit width.

Optimizing Spectral Acquisition (DAD only)

Storage of all spectra consumes a lot of disk space. It is very useful to have all spectra available during optimization of a method or when analyzing unique samples. However when running many samples of the same type, the large size of data files with all spectra may become a burden. The detector provides functions to reduce the amount of data, yet retaining the relevant spectral information.

For spectra options see "Spectrum Settings" on page 99.

Range

Only the wavelength range where the compounds in your sample absorb contains information that is useful for purity checks and library searches. Reducing the spectrum storage range saves disk space.

Step

Most substances have broad absorbance bands. Display of spectra, peak purity and library search works best if a spectrum contains 5 to 10 data points per width of the absorbance bands. For anisic acid (the example used before) a step of 4 nm would be sufficient. However a step of 2 nm gives a more optimal display of the spectrum.

Threshold

Sets the peak detector. Only spectra from peaks higher than threshold will be stored when a peak-controlled storage mode is selected.

Margin for Negative Absorbance

The detector adjusts its gain during *balance* such that the baseline may drift slightly negative (about -100 mAU). In some special case, for example, when gradient with absorbing solvents are used, the baseline may drift to more negative values.

Only for such cases, increase the margin for negative absorbance to avoid overflow of the analog-to-digital converter.

Optimizing Selectivity

Quantifying Coeluting Peaks by Peak Suppression

In chromatography, two compounds may often elute together. A conventional dual-signal detector can only detect and quantify both compounds independently from each other if their spectra do not overlap. However, in most cases this is highly unlikely.

With a dual-channel detector based on diode-array technology, quantifying two compounds is possible even when both compounds absorb over the whole wavelength range. The procedure is called peak suppression or signal subtraction. As an example, the analysis of hydrochlorothiazide in the presence of caffeine is described. If hydrochlorothiazide is analyzed in biological samples, there is always a risk that caffeine is present which might interfere chromatographically with hydrochlorothiazide. As the spectra in Figure 62 show, hydrochlorothiazide is best detected at 222 nm, where caffeine also shows significant absorbance. It would therefore be impossible, with a conventional variable wavelength detector, to detect hydrochlorothiazide quantitatively when caffeine is present.

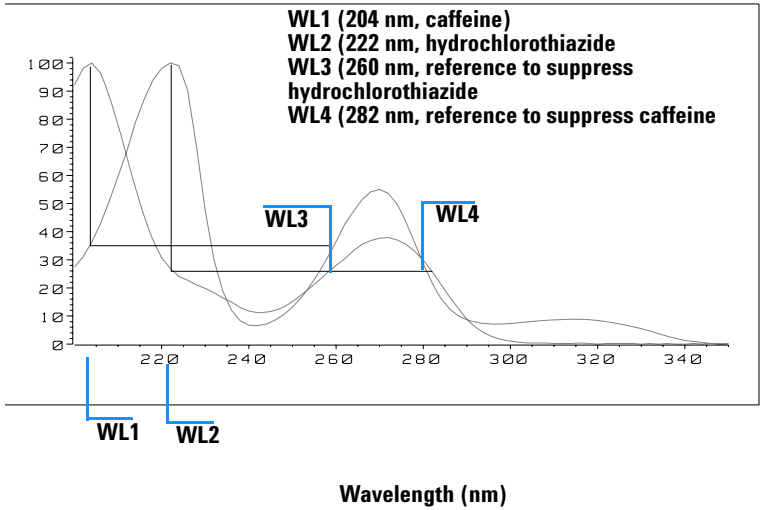


Figure 62 Wavelength Selection for Peak Suppression

With a UV-visible detector based on a diode array and the correct choice of a reference wavelength setting, quantitative detection is possible. To suppress caffeine, the reference wavelength must be set to 282 nm. At this wavelength, caffeine shows exactly the same absorbance as at 222 nm. When the absorbance values are subtracted from each another, any indication of the presence of caffeine is eliminated. In the same way, hydrochlorothiazide can be suppressed if caffeine is to be quantified. In this case the wavelength is set to 204 nm and the reference wavelength to 260 nm. Figure 63 shows the chromatographic results of the peak suppression technique.

The trade-off for this procedure is a loss in sensitivity. The sample signal decreases by the absorbance at the reference wavelength relative to the signal wavelength. Sensitivity may be decreased by as much as 10–30 %.

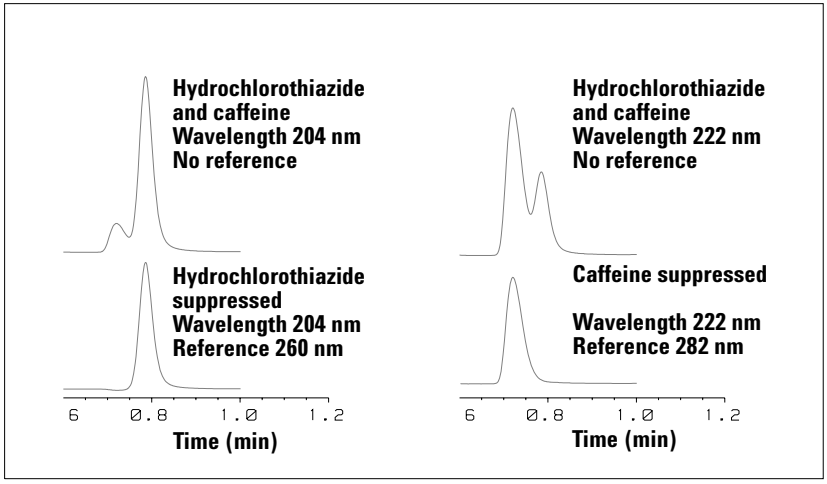


Figure 63 Peak Suppression Using Reference Wavelength

Ratio Qualifiers for Selective Detection of Compound Classes

Ratio qualifiers can be used where, in a complex sample, only one particular class needs to be analyzed — a parent drug and its metabolites in a biological sample, for example. Another example is the selective analysis of derivatives after pre or postcolumn derivatization. Specifying a signal ratio that is typical for the sample class is one way of selectively plotting only those peaks that are of interest. The signal output remains at zero so long as the ratio is out of the user-specified ratio range. When the ratio falls within the range, the signal output corresponds to the normal absorbance, giving single, clear peaks on a flat baseline. An example is shown in Figure 64 and Figure 65.

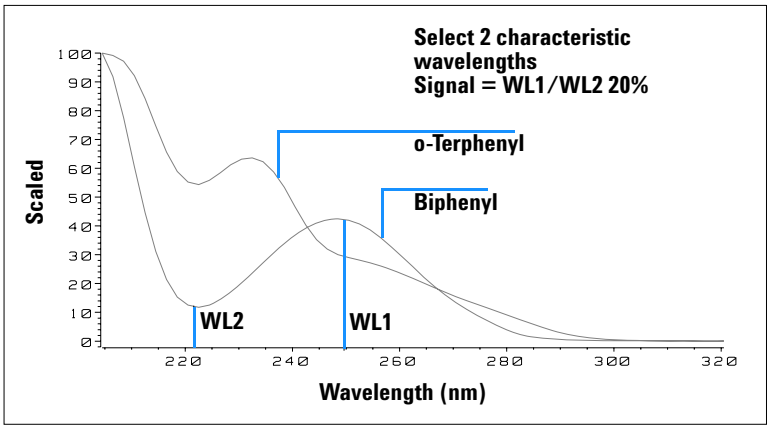


Figure 64 Wavelength Selection for Ratio Qualifiers

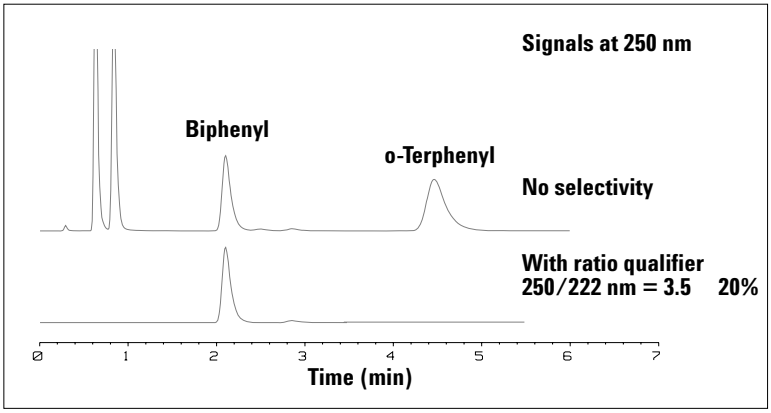


Figure 65 Selectivity by Ratio Qualifiers

In a four-component mixture, only biphenyl was recorded. The other three peaks were suppressed because they did not meet the ratio-qualifier criterion and therefore the output was set to zero. The characteristic wavelengths 249 nm (λ_1) and 224 nm (λ_2) were found from the spectra shown in Figure 64.

The ratio range was set at 2 – 2.4 (2.2 ±10%). Only when the ratio between 249 and 224 nm was within this range, is the signal plotted. Of all four peaks, only the third fulfilled the criterion (Figure 65). The others were not plotted.

7
Troubleshooting and Diagnostics

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Agilent LC Diagnostic Software 130

This chapter gives an overview about the troubleshooting and diagnostic features and the different user interfaces.

Overview of the Detector's Indicators and Test Functions

Status Indicators

The detector is provided with two status indicators which indicate the operational state (prerun, run, and error states) of the detector. The status indicators provide a quick visual check of the operation of the detector.

Error Messages

In the event of an electronic, mechanical or hydraulic failure, the detector generates an error message in the user interface. For each message, a short description of the failure, a list of probable causes of the problem, and a list of suggested actions to fix the problem are provided (see "Error Information" on page 131.).

Test Functions

A series of test functions are available for troubleshooting and operational verification after exchanging internal components (see "Test Functions" on page 159 or "Tests & Calibrations" on page 243).

Wavelength Verification / Recalibration

Wavelength recalibration is recommended after exchange of lamps and flow cells, maintenance of flow cells, repair of internal components, and on a regular basis to ensure correct operation of the detector. The detector uses the deuterium alpha and beta emission lines for wavelength calibration (see "Wavelength Verification and Recalibration" on page 176 or "Wavelength Verification and Recalibration" on page 246).

Diagnostic Signals

The detector has several signals (internal temperatures, voltages and currents of lamps) that can be used for diagnosing baseline problems (see "Diagnostic Signals" on page 183).

Status Indicators

Two status indicators are located on the front of the detector. The lower left indicates the power supply status, the upper right indicates the detector status.

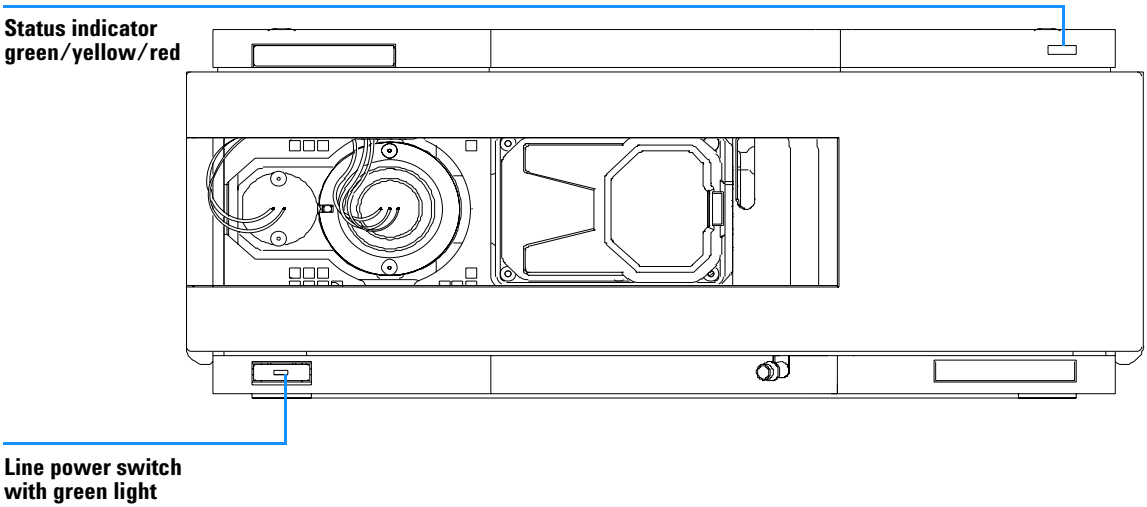

Figure 66 Location of Status Indicators

Power Supply Indicator

The power supply indicator is integrated into the main power switch. When the indicator is illuminated (*green*) the power is *ON*.

Detector Status Indicator

The detector status indicator indicates one of four possible detector conditions:

- When the status indicator is *OFF* (and power switch light is on), the detector is in a *prerun* condition, and is ready to begin an analysis.
- A *green* status indicator, indicates the detector is performing an analysis (*run* mode).
- A *yellow* indicator indicates a *not-ready* condition. The detector is in a not-ready state when it is waiting for a specific condition to be reached or completed (for example, immediately after changing a set point), or while a self-test procedure is running.
- An *error* condition is indicated when the status indicator is *red*. An error condition indicates the detector has detected an internal problem which affects correct operation of the detector. Usually, an error condition requires attention (e.g. leak, defective internal components). An error condition always interrupts the analysis.
- A *red-blinking* indicator indicates that the module is in resident mode (e.g. during update of main firmware).

User Interfaces

Depending on the user interface the available tests vary. All test descriptions are based on the Agilent ChemStation as user interface. Some descriptions are only available in the Service Manual.

Table 20 Test Functions avaible vs. User Interface

Test	ChemStation	Instant Pilot G4208A	Control Module G1323B
Selftest	Yes	No	No
Filter	Yes	No	No
Slit	Yes	No	Yes
D/A Converter	Yes	No	No
Test Chromatogram	Yes (C)	No	Yes
Wavelength Calibration	Yes	Yes (M)	Yes
Lamp Intensity	Yes	Yes (D)	Yes
Holmium	Yes	Yes (D)	Yes
Cell	Yes	Yes (D)	No
Dark Current	Yes	Yes (D)	No

C via command
M section Maintenance
D section Diagnose

NOTE The Agilent Control Module (G1323B) does not do any calculations. So there will be no reports generated with passed/failed information.

Agilent LC Diagnostic Software

The Agilent LC diagnostic software is an application independent tool that provides troubleshooting capabilities for the Agilent 1200 Series modules. It provides for all 1200 Series LC the possibility of a first guided diagnostic for typical HPLC symptoms and a status report stored as Adobe Acrobat pdf or as a printable file to assist users evaluating the instrument state.

At the introduction, following modules will be fully supported by the software, including module tests and calibrations as well as injector steps and maintenance positions.

- Agilent 1200 Series binary pump SL (G1312B)
- Agilent 1200 Series high performance autosampler SL (G1367B)
- Agilent 1200 Series thermostatted column compartment SL (G1316B)
- Agilent 1200 Series diode array detector SL (G1315C)

With further releases of the diagnostic software all Agilent 1200 Series HPLC modules will be fully supported.

This diagnostic software provides tests and diagnostic features that may differ from the descriptions in this manual. For details refer to the help files provided with the diagnostic software.

8
Error Information

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General Error Messages 133
Detector Error Messages 143

This chapter describes the meaning of detector error messages, and provides information on probable causes and suggested actions how to recover from error conditions.

What Are Error Messages

Error messages are displayed in the user interface when an electronic, mechanical, or hydraulic (flow path) failure occurs which requires attention before the analysis can be continued (for example, repair, or exchange of consumables is necessary). In the event of such a failure, the red status indicator at the front of the detector is switched on, and an entry is written into the detector logbook.

General Error Messages

General error messages are generic to all Agilent 1200 series HPLC modules.

Timeout

The timeout threshold was exceeded.

Probable Causes

- The analysis was completed successfully, and the timeout function switched off the pump as requested.
- A not-ready state was present during a sequence or multiple-injection run for a period longer than the timeout threshold.

Suggested Actions

✔ Check the logbook for the occurrence and source of a not-ready condition. Restart the analysis where required.

Shutdown

An external instrument has generated a shut-down signal (through CAN or REMOTE lines).

The detector continually monitors the remote input connectors for status signals. A LOW signal input on pin 4 of the remote connector generates the error message.

Probable Causes

- Leak detected in an external instrument with a remote connection to the system.
- Shut-down in an external instrument with a remote connection to the system.
- The degasser failed to generate sufficient vacuum for solvent degassing.

Suggested Actions

✔ Fix the leak in the external instrument before restarting the pump.

✔ Check external instruments for a shut-down condition.

✔ Check the degasser for an error condition. Refer to the *Reference Manual* for the Aligent 1200 Series vacuum degasser.

Remote Timeout

A not-ready condition is still present on the remote input.

When an analysis is started, the system expects all not-ready conditions (e.g. a not-ready condition during detector balance) to switch to run conditions within one minute of starting the analysis. If a not-ready condition is still present on the remote line after one minute the error message is generated.

Probable Causes

- Not-ready condition in one of the instruments connected to the remote line.
- Defective remote cable.
- Defective components in the instrument showing the not-ready condition.

Suggested Actions

✔ Ensure the instrument showing the not-ready condition is installed correctly, and is set up correctly for analysis.

✔ Exchange the remote cable.

✔ Check the instrument for defects (refer to the instrument's reference documentation).

Synchronization Lost

During an analysis, the internal synchronization or communication between one or more of the modules in the system has failed.

The system processors continually monitor the system configuration. If one or more of the modules is no longer recognized as being connected to the system, the error message is generated.

Probable Causes

- CAN cable disconnected.
- Defective CAN cable.
- Defective main board in another module.

Suggested Actions

✔ Ensure all the CAN cables are connected correctly.

✔ Switch off the system. Restart the system, and determine which module or modules are not recognized by the system.

Leak

A leak was detected in the detector.

The signals from the two temperature sensors (leak sensor and board-mounted temperature-compensation sensor) are used by the leak algorithm to determine whether a leak is present. When a leak occurs, the leak sensor is cooled by the solvent. This changes the resistance of the leak sensor which is sensed by the leak-sensor circuit on the detector main board.

Probable Causes

- Loose fittings.
- Broken capillary.
- Leaking flow cell.

Suggested Actions

✔ Ensure all fittings are tight.

✔ Exchange defective capillaries.

✔ Exchange flow cell components.

Additional Information

Detector leak error may be caused by the Aligent 1200 sampler. In each sampler injection sequence, step# 2 ejects the mobile phase stored in the metering head during the previous injection. This mobile phase is ejected through the short plastic tube connected to port# 4 of the sampler switching valve. The output of port# 4 is integrated into the sampler's contingency leak drain system, which eventually terminates in the leak pan of the bottom module of the stack - the detector. With normal injection volumes and run times, the output of port# 4 is small, and evaporates right in the sampler leak pan. However, the output of port# 4 is significant, and a substantial volume of ejected mobile phase reaches the detector leak pan.

There are two possible fixes. Select the one which is most convenient.

1 The waste drain plumbing orientation, shown in step 5 on page 44, eliminates the possibility of any leak drainage from above reaching the detector leak pan. The leak drain for the detector can be connected to the detector's leak drain fitting, and taken to waste separately.

2 If it is desired that the system has only one leak drain tube, then it's possible in increase the length of the small plastic tube which is connected

to port# 4 of the sampler switching valve. This tube can then be taken to waste separately. The tube which normally serves as the detector cell outlet tube can be used for this purpose.

Leak Sensor Open

The leak sensor in the detector has failed (open circuit).

The current through the leak sensor is dependent on temperature. A leak is detected when solvent cools the leak sensor, causing the leak sensor current to change within defined limits. If the current falls outside the lower limit, the error message is generated.

Probable Causes

- Leak sensor not connected to the detector main board.
- Defective leak sensor.

Suggested Actions

✔ Ensure the leak sensor is connected correctly.

✔ Exchange the leak sensor.

Leak Sensor Short

The leak sensor in the detector has failed (short circuit).

The current through the leak sensor is dependent on temperature. A leak is detected when solvent cools the leak sensor, causing the leak sensor current to change within defined limits. If the current increases above the upper limit, the error message is generated.

Probable Causes

- Defective leak sensor.

Suggested Actions

✔ Exchange the leak sensor.

Compensation Sensor Open

The ambient-compensation sensor (NTC) on the detector main board in the detector has failed (open circuit).

The resistance across the temperature compensation sensor (NTC) on the detector main board is dependent on ambient temperature. The change in resistance is used by the leak circuit to compensate for ambient temperature changes. If the resistance across the sensor increases above the upper limit, the error message is generated.

Probable Causes

- Defective detector main board.

Suggested Actions

✔ Exchange the detector main board.

Compensation Sensor Short

The ambient-compensation sensor (NTC) on the detector main board in the detector has failed (short circuit).

The resistance across the temperature compensation sensor (NTC) on the detector main board is dependent on ambient temperature. The change in resistance is used by the leak circuit to compensate for ambient temperature changes. If the resistance across the sensor falls below the lower limit, the error message is generated.

Probable Causes

- Defective detector main board.

Suggested Actions

✔ Exchange the detector main board.

Fan Failed

The cooling fan in the detector has failed.

The hall sensor on the fan shaft is used by the detector main board to monitor the fan speed. If the fan speed falls below two revolutions/second for more than five seconds, the error message is generated.

Probable Causes

- Fan cable disconnected.
- Defective fan.
- Defective detector main board.

Suggested Actions

✔ Ensure the fan is connected correctly.

✔ Exchange fan.

✔ Exchange the detector main board.

Open Cover

The top foam has been removed.

The sensor on the detector main board detects when the top foam is in place. If the foam is removed, the fan is switched off, and the error message is generated.

Probable Causes

- The top foam was removed during operation.
- Foam not activating the sensor.

Suggested Actions

✔ Replace the top foam.

✔ Exchange the foam.

Cover Violation

The top foam has been removed.

The sensor on the detector main board detects when the top foam is in place. If the foam is removed while the lamps are on (or if an attempt is made to switch on the lamps with the foam removed), the lamps are switched off, and the error message is generated.

Probable Causes

- The top foam was removed during operation.
- Foam not activating the sensor.

Suggested Actions

✔ Replace the top foam.

✔ Exchange the foam.

Detector Error Messages

These errors are detector specific.

Visible Lamp Current

The visible lamp current is missing.

The processor continually monitors the lamp current during operation. If the current falls below the lower current limit, the error message is generated.

Probable Causes

- Visible lamp disconnected.
- Defective visible lamp.
- Defective detector main board.
- Defective power supply.

Suggested Actions

✔ Ensure the visible lamp connector is seated firmly.

✔ Exchange the visible lamp.

✔ Exchange the detector main board.

✔ Exchange the power supply.

Visible Lamp Voltage

The visible lamp voltage is missing.

The processor continually monitors the voltage across the lamp during operation. If the lamp voltage falls below the lower limit, the error message is generated.

Probable Causes

- Defective detector main board.
- Defective power supply.

Suggested Actions

✔ Exchange the detector main board.

✔ Exchange the power supply.

Calibration Values Invalid

The calibration values read from the spectrometer ROM are invalid.

After recalibration, the calibration values are stored in ROM. The processor periodically checks if the calibration data are valid. If the data are invalid or cannot be read from the spectrometer ROM, the error message is generated.

Probable Causes

- Defective detector main board.
- Defective optical unit.

Suggested Actions

✔ Exchange the detector main board.

✔ Exchange the optical unit.

Wavelength Recalibration Lost

Te calibration information needed for your detector to operate correctly has been lost.

During calibration of the detector the calibration values are stored in ROM. If no data is available in the spectrometer ROM, the error message is generated.

Probable Causes

- The detector is new.
- The detector has been repaired.

Suggested Actions

✔ Recalibrate the detector.

✔ Exchange the optical unit.

Diode Current Leakage

When the detector is switched on, the processor checks the leakage current of each of the optical diodes. If the leakage current exceeds the upper limit, the error message is generated.

Probable Causes

- Defective optical unit.
- Defective detector main board.

Suggested Actions

✔ Exchange the optical unit.

✔ Defective detector main board.

Holmium Oxide Test Failed

The holmium oxide test in the detector has failed.

During the holmium test, the detector moves the holmium filter through the light path while monitoring the detector signal response. As the edge of the filter passes through the light path, the signal is interrupted. This is used to determine the position of the filter, and whether the filter is moving correctly. If the filter fails to move, the error message is generated.

Probable Causes

- Lamps switched off.
- Defective or dirty flow cell.
- Defective filter assembly.
- Defective achromat assembly.
- Defective optical unit.

Suggested Actions

✔ Ensure the lamps are switched on.

✔ Ensure the flow cell is inserted correctly, and is free from contamination (cell windows, buffers etc.).

✔ Exchange the filter assembly.

✔ Exchange the achromat assembly.

✔ Exchange the optical unit.

UV Lamp Current

The UV lamp current is missing.

The processor continually monitors the anode current drawn by the lamp during operation. If the anode current falls below the lower current limit, the error message is generated.

Probable Causes

- UV lamp disconnected.
- Defective UV lamp or non-Agilent lamp.
- Defective detector main board.
- Defective power supply.

Suggested Actions

✔ Ensure the UV lamp connector is seated firmly.

✔ Exchange the UV lamp.

✔ Exchange the detector main board.

✔ Exchange the power supply.

UV Lamp Voltage

The UV lamp anode voltage is missing.

The processor continually monitors the anode voltage across the lamp during operation. If the anode voltage falls below the lower limit, the error message is generated.

Probable Causes

- Defective UV lamp or non-Agilent lamp.
- Defective detector main board.
- Defective power supply.

Suggested Actions

✔ Exchange the UV lamp.

✔ Exchange the detector main board.

✔ Exchange the power supply.

UV Ignition Failed

The UV lamp failed to ignite.

The processor monitors the UV lamp current during the ignition cycle. If the lamp current does not rise above the lower limit within 2 – 5 seconds, the error message is generated.

Probable Causes

- Lamp too hot. Hot gas discharge lamps may not ignite as easily as cold lamps.
- Lamp not connected.
- Defective UV lamp or non-Agilent lamp.
- Defective detector main board.
- Defective power supply.

Suggested Actions

✔ Switch off the lamp and allow it to cool down for at least 15 minutes.

✔ Ensure the lamp is connected.

✔ Exchange the UV lamp.

✔ Exchange the detector main board.

✔ Exchange the power supply.

UV Heater Current

The UV lamp heater current is missing.

During UV lamp ignition, the processor monitors the heater current. If the current does not rise above the lower limit within one second, the error message is generated.

Probable Causes

- UV Lamp not connected.
- Ignition started without the top foam in place.
- Defective UV lamp or non-Agilent lamp.
- Defective detector main board.
- Defective power supply.

Suggested Actions

✔ Ensure the UV lamp is connected.

✔ Replace the top foam, and turn on the lamp.

✔ Exchange the UV lamp.

✔ Exchange the detector main board.

✔ Exchange the power supply.

Illegal Value From Temperature Sensor

This temperature sensor delivered a value outside the allowed range. The parameter of this event equals the measured temperature in 1/100 centigrade. As a result the temperature control is switched off.

Probable Causes

- The sensor is defect
- Detector is exposed to illegal ambient conditions.

Suggested Actions

✔ Ensure the connector to the detector main board is seated firmly.

✔ Verify that the ambient conditions are within the allowed range.

✔ Exchange temperature sensor assembly.

Illegal Value From Air Inlet Temperature Sensor

This temperature sensor (located on the detector main board) delivered a value outside the allowed range. The parameter of this event equals the measured temperature in 1/100 centigrade. As a result the temperature control is switched off.

Probable Causes

- The sensor is defect
- Detector is exposed to illegal ambient conditions.

Suggested Actions

✔ Verify that the ambient conditions are within the allowed range.

✔ Exchange detector main board.

Heater Failed

Every time the deuterium lamp or the tungsten lamp is switched on or off a heater self-test is performed. If the test fails an error event is created. As a result the temperature control is switched off.

Probable Causes

- Defective connector or cable.
- Defective heater.

Suggested Actions

✔ Ensure the connector to the detector main board is seated firmly.

✔ Exchange heater assembly.

Heater Power At Limit

The available power of the heater reached either the upper or lower limit. This event is sent only once per run. The parameter determines which limit has been hit:

0 means upper power limit hit (excessive ambient temperature drop).

1 means lower power limit hit (excessive ambient temperature increase).

Probable Causes

- Ambient conditions have changed too much during the run, so that optimum results may not be guaranteed.

Suggested Actions

✔ Verify that the reproducibility of your results is not affected

✔ Expose the detector to more stable ambient conditions.

No Run Data Available In Device (G1315C/G1365C only)

In a very rare case the capacity of the CompactFlash Card is not sufficient. This could happen for example when the interrupt of LAN communication takes longer and the detector uses special settings (e.g full data rate at 80 Hz plus full spectra plus all signals) during data buffering.

Probable Causes

- CompactFlash Card is full.

Suggested Actions

✔ Correct communication problem.

✔ Reduce data rate.

```
Method       Instrument run started                          09:44:46 11/20/05
1200 DAD   1 Power on                                        10:07:24 11/20/05
1200 DAD   1 UV-lamp on                                      10:07:24 11/20/05
1200 DAD   1 Vis-lamp on                                     10:07:24 11/20/05
1200 DAD   1 No Run data available in device!                10:07:24 11/20/05
CP Macro     Analyzing rawdata SHORT_02.D                    10:07:25 11/20/05
Method       Instrument Error - Method/Sequence stopped      10:07:25 11/20/05
Method       Method aborted                                  10:09:52 11/20/05
```

Figure 67 Instrument Logbook

NOTE The logbook does not indicate a communication loss (power fail). It just shows the recovering (Power on, Lamps on).

DSP Not Running

This error message comes up when the communiucation between the optical unit and the main board has a problem.

Probable Causes

- Random communication error.
- Defective detector main board.
- Defective optical unit

Suggested Actions

✔ Switch the detector off and on again at the power switch. If the error reoccurs:

✔ Check cable between optical unit and detector main board

✔ Exchange the detector main board

✔ Replace optical unit

9
Test Functions

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This chapter describes the detector's built in test functions.

Self-test

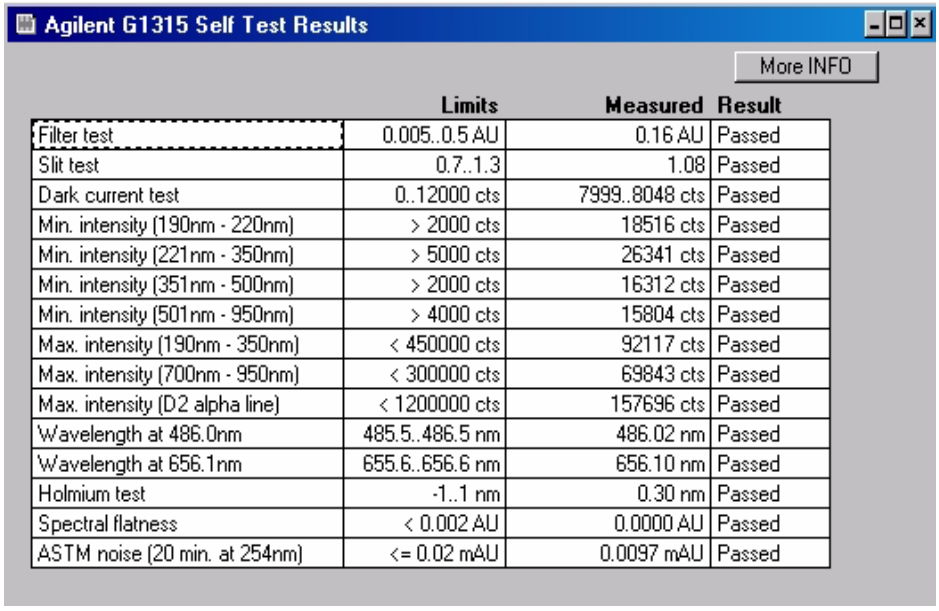
The DAD self-test (see “Self-test Results (report)” on page 161) runs a series of individual tests, and evaluates the results automatically. The following tests are run:

- Filter Test
- Slit Test
- Dark Current Test
- Intensity Test
- Wavelength Calibration Test
- Holmium Test
- Spectral Flatness Test
- ASTM Noise Test (optional)

The self-test can be run once or repetitively. When set up to run repetitively, the tests run in series continually until stopped by the user. Running the test repetitively is useful when troubleshooting problems which occur intermittently.

The ASTM noise test determines the detector baseline noise (254nm) while pumping water at 1ml/min. The test requires approximately 20 minutes to run, and can be included or excluded from the self-test sequence as required.

Setup of the self test is done in the Self Test dialog box. Select either Single Test or Repetitive Tests. Check the ASTM Noise Test checkbox to include the noise test in the self test.



	Limits	Measured	Result
Filter test	0.005..0.5 AU	0.16 AU	Passed
Slit test	0.7..1.3	1.08	Passed
Dark current test	0..12000 cts	7999..8048 cts	Passed
Min. intensity (190nm - 220nm)	> 2000 cts	18516 cts	Passed
Min. intensity (221nm - 350nm)	> 5000 cts	26341 cts	Passed
Min. intensity (351nm - 500nm)	> 2000 cts	16312 cts	Passed
Min. intensity (501nm - 950nm)	> 4000 cts	15804 cts	Passed
Max. intensity (190nm - 350nm)	< 450000 cts	92117 cts	Passed
Max. intensity (700nm - 950nm)	< 300000 cts	69843 cts	Passed
Max. intensity (D2 alpha line)	< 1200000 cts	157696 cts	Passed
Wavelength at 486.0nm	485.5..486.5 nm	486.02 nm	Passed
Wavelength at 656.1nm	655.6..656.6 nm	656.10 nm	Passed
Holmium test	-1..1 nm	0.30 nm	Passed
Spectral flatness	< 0.002 AU	0.0000 AU	Passed
ASTM noise (20 min. at 254nm)	<= 0.02 mAU	0.0097 mAU	Passed

Figure 68 Self-test Results (report)

For details refer to the individual tests on the following pages.

Filter Test

The filter test checks the correct operation of the filter assembly. When the test is started, the holmium oxide filter is moved into position. During filter movement, the absorbance signal is monitored. As the edge of the filter passes through the light path, an absorbance maximum is seen. Once the filter is in position, the absorbance maximum (of holmium oxide) is determined. Finally, the filter is moved out of the light path. During movement, an additional absorbance maximum is expected as the edge of the filter passes through the light path. The test passes successfully, if the two maxima resulting from the edge of the filter assembly (during filter movement) are seen, and the absorbance maximum of holmium oxide is within the limits.

```
Instrument:       G1315C
Serial Number:    FP00000024
Operator:         Wolfgang
Date:             25.02.2005
Time:             14:55:42
File:             C:\CHEM32\2\DIAGNOSE\DAD_FILTER3.DGR

                                                                    |     Result | Status
--------------------------------------------------------------------------------------------
DAD Filter Test                                                     |            |
Date: 25.02.2005;  Time: 14:55:42                                   |            |
Expected total time: approx. 45s.                                   |            |
                                                                    |            |
Test Procedure:                                                     |            |
1. Measuring and evaluating filter test result                      |       0.16 | done
```

Figure 69 Filter Test Results (report)

Filter Test Evaluation

Test Failed

Probable Causes

- Filter assembly (lever and filter) not installed.
- Defective filter motor.

Suggested Actions

✔ Install the filter assembly.

✔ Exchange the filter motor.

Holmium Oxide Maximum out of Limits

Probable Causes

- Holmium oxide filter not installed.
- Dirty or contaminated filter.

Suggested Actions

✔ Install the holmium oxide filter.

✔ Exchange the holmium oxide filter.

Slit Test

The slit test verifies correct operation of the micromechanical slit. During the test, the slit is moved through all slit positions while the detector monitors the lamp intensity change. When the slit position is changed, the intensity drop (move to smaller slit) or intensity increase (move to larger slit) must be within a defined range. If the intensity changes are outside the expected range, the test fails.

Slit Test Evaluation

Limit: 0.7 - 1.3

Test Failed

Probable Causes

- Flow cell still installed.
- Old lamp.
- Defective slit assembly.
- Defective detector main board.
- Defective optical unit.

Suggested Actions

✔ Remove the flow cell.

✔ Run the "Intensity Test" on page 167. Exchange the lamp if old or defective.

✔ Exchange the slit assembly.

✔ Exchange the detector main board.

✔ Exchange the optical unit.

Dark-Current Test

The dark-current test measures the leakage current from each diode. The test is used to check for leaking diodes which may cause non-linearity at specific wavelengths. During the test, the slit assembly moves to the dark position, cutting off all light falling onto the diode array. Next, the leakage current from each diode is measured, and displayed graphically (see Figure 70). The leakage current (represented in *counts*) for each diode should fall within the limits (red bands) shown in the plot (see Figure 70).

NOTE The evaluation report is only on the Agilent ChemStation available.

Dark-Current Test Evaluation

Limit: 0... 12000 counts

Test Failed

Probable Causes

- Defective slit assembly (stray light).
- Defective detector main board.
- Defective optical unit.

Suggested Actions

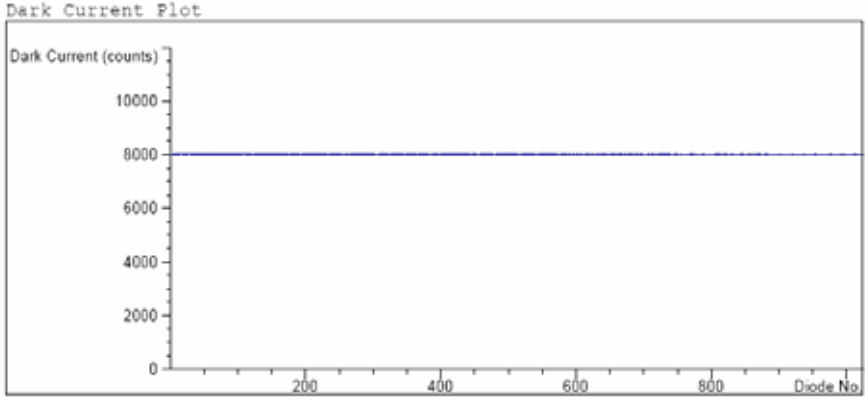
✔ Run the "Slit Test" on page 164 (part of the "Self-test" on page 160).

✔ Exchange the detector main board.

Exchange the optical unit.

```
Instrument:         G1315C
Serial Number:      PP00000024
Operator:           Wolfgang
Date:               25.02.2005
Time:               14:50:12
File:               C:\CHEM32\2\DIAGNOSE\DAD_DARK2.DGR

Dark Current Plot
```




```
Dark Current Test Results

                                          Specification    Measured  Result
-------------------------------------------------------------------------------
Dark current maximum value                <= 12000 cts     8056 cts  Passed
Dark current minimum value                     > 0 cts     7994 cts  Passed
```

Figure 70 Dark-Current Test Results (report)

Intensity Test

NOTE The test is for the standard flow cells (10 mm and 6 mm pathlength) only. The nano-flow cells (80 nl and 500 nl) cannot be run with this test due to its low volume.

The intensity test measures the intensity of the deuterium and tungsten lamps over the full wavelength range (190 – 950 nm). Four spectral ranges are used to evaluate the intensity spectrum. The test is used to determine the performance of the lamps and optics (see also "Cell Test" on page 174). When the test is started, the 1-nm slit is moved into the light path automatically, and the gain is set to zero. To eliminate effects due to absorbing solvents, the test should be done with water in the flow cell. The shape of the intensity spectrum is primarily dependent on the lamp, grating, and diode array characteristics. Therefore, intensity spectra will differ slightly between instruments. Figure 71 on page 168 shows a typical intensity test spectrum.

Intensity Test Evaluation

The Agilent ChemStation evaluates four spectral ranges automatically, and displays the limits for each range, the measured intensity counts, and *passed* or *failed* for each spectral range (see Figure 71 on page 168).

NOTE The evaluation report is only on the Agilent ChemStation available.

Test Failed

Probable Causes

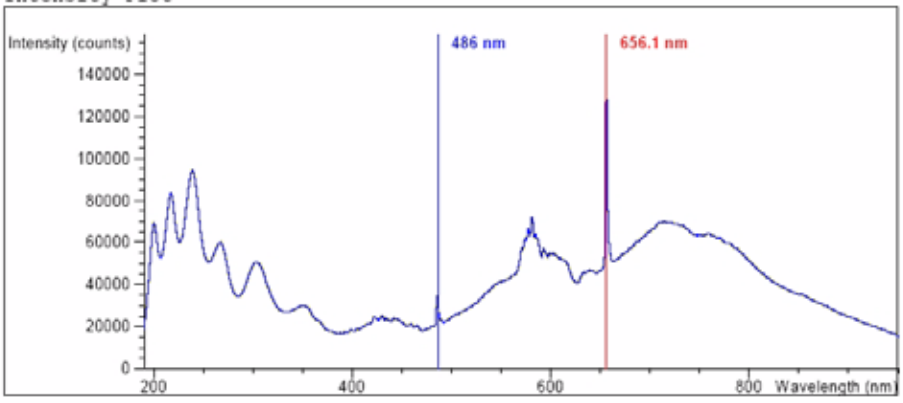
- Absorbing solvent or air bubble in flow cell.
- Dirty or contaminated flow cell.
- Dirty or contaminated optical components (achromat, windows).
- Old or non-Agilent lamp.

Suggested Actions

- ✔ Ensure the flow cell is filled with water, and free from air bubbles.
- ✔ Run the cell test (see “Cell Test” on page 174). If the test fails, exchange the flow cell windows.
- ✔ Clean optical components with alcohol and lint-free cloth.
- ✔ Exchange the lamp.

```
Instrument:       G1315C
Serial Number:    PP00000024
Operator:         Wolfgang
Date:             25.02.2005
Time:             14:53:05
File:             C:\CHEM32\2\DIAGNOSE\DAD_INT2.DGR
```

Intensity Plot



Intensity Test Results

	Specification	Measured	Result
Accumulated UV lamp on time		23.77 h	
Lowest intensity in range 190nm - 220nm:	> 2000 cts	18095 cts	Passed
Lowest intensity in range 221nm - 350nm:	> 5000 cts	26848 cts	Passed
Lowest intensity in range 351nm - 500nm:	> 2000 cts	16593 cts	Passed
Lowest intensity in range 501nm - 950nm:	> 4000 cts	15767 cts	Passed
Highest intensity in range 190nm - 350nm:	< 450000 cts	94508 cts	Passed
Highest intensity in range 700nm - 950nm:	< 300000 cts	69968 cts	Passed
Highest intensity for the D2 alpha line:	< 1200000 cts	159202 cts	Passed

Figure 71 Intensity Test Results (report)

Holmium Oxide Test

The holmium oxide test uses three characteristic absorbance maxima of the built-in holmium oxide filter to verify wavelength accuracy (see also "Wavelength Verification and Recalibration" on page 176). When the test is started, the 1-nm slit is moved into the light path automatically. To eliminate effects due to absorbing solvents, the test should be done with water in the flow cell.

NOTE See also "Declaration of Conformity for HOX2 Filter" on page 391.

Holmium Oxide Test Evaluation

Limits:

361.0 nm	360.0 - 362.0 nm (± 1nm)
453.7 nm	452.7 - 454.7 nm (± 1nm)
536.7 nm	535.7 - 537.7 nm (± 1nm)

The test is evaluated by the instrument, and the measured maxima are displayed automatically. The test fails if one or more of the maxima lies outside of the limits (see Figure 72 on page 171).

NOTE The evaluation report is only on the Agilent ChemStation available.

Test Failed

Probable Causes

- Absorbing solvent or air bubble in flow cell.
- Incorrect calibration
- Dirty or contaminated flow cell.

- Dirty or contaminated optical components (achromat, windows).
- Old or non-Agilent lamp.

Suggested Actions

✔ Ensure the flow cell is filled with water.

✔ Recalibrate (see “Wavelength Verification and Recalibration” on page 176) and repeat the test.

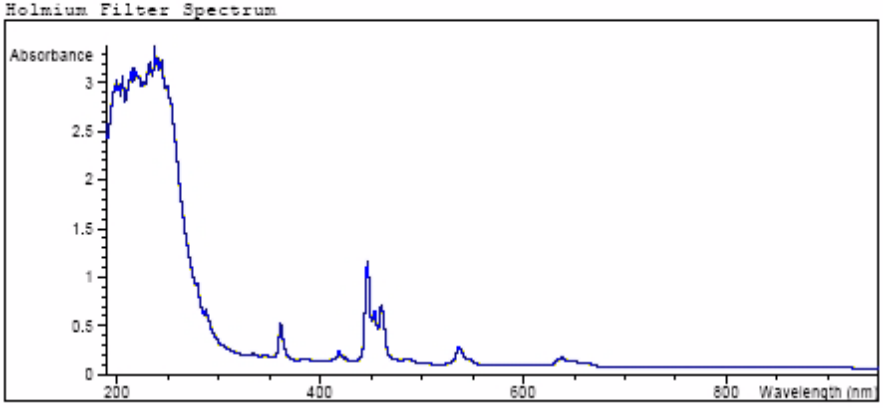
✔ Run the cell test (see “Cell Test” on page 174). If the test fails, exchange the flow cell windows.

✔ Clean optical components with alcohol and lint-free cloth.

✔ Exchange the UV lamp.

```
Instrument:         G1315C
Serial Number:      PP00000024
Operator:           Wolfgang
Date:               25.02.2005
Time:               14:30:08
File:               C:\CHEM32\2\DIAGNOSE\DAD_FILTER2.DGR
```

Holmium Filter Spectrum



Holmium Filter Test Results

	Specification	Measured	Result
Wavelength 1: 361.0 nm	360..362 nm	360.9 nm	Passed
Wavelength 2: 453.7 nm	452.7..454.7 nm	453.4 nm	Passed
Wavelength 3: 536.7 nm	535.7..537.7 nm	536.8 nm	Passed

Figure 72 Holmium Oxide Test Results (report)

Spectral Flatness Test

The spectral flatness test determines the maximum noise (in mAU) on the spectrum. The test is run with the flowcell removed to eliminate effects due to absorbing solvent or a dirty flowcell. First, a detector balance is done. Next, a spectrum (no flowcell) is taken.

Theoretically, the spectrum should be flat, however, in practice, noise is superimposed on the spectrum. The amplitude of the noise is a measure of the optical and electronic performance.

NOTE This test is part of the detector self test only, see "Self-test" on page 160.

Spectral Flatness Evaluation

Limit is < 0.002 AU

Test Failed

Probable causes

- Old lamp
- Defective DAM board
- Defective optical unit.

Suggested Actions

✔ Run the Intensity Test.

✔ Exchange the lamp if old or defective.

✔ Exchange the DAM board.

✔ Exchange the optical unit.

ASTM Noise Test

The ASTM noise test determines the detector noise over a period of 20 minutes. The test is done with the flowcell removed, so the test results are not influenced by solvent or pump effects. On completion of the test, the noise result is displayed automatically.

NOTE This test is part of the detector self test only, see "Self-test" on page 160.

ASTM Noise Test Evaluation

Limit is ± 0.02 mAU

Test Failed

Probable causes

- Insufficient lamp warm-up time
- Old lamp

Suggested Actions

✔ Allow lamp to warm-up for at least 1 hour.

✔ Exchange the lamp.

Cell Test

The cell test measures the intensity of the deuterium and tungsten lamps over the full wavelength range (190 – 950 nm), once with the flow cell installed, and once with the flow cell removed. The resulting intensity ratio is a measure of the amount of light absorbed by the flow cell. The test can be used to check for dirty or contaminated flow cell windows. When the test is started, the 1-nm slit is moved into the light path automatically, and the gain is set to zero. To eliminate effects due to absorbing solvents, the test should be done with water in the flow cell.

NOTE This test should be performed inititially with a new detector/flow cell. The values should be kept for later reference/comparison.

Cell Test Evaluation

The Agilent ChemStation calculates the intensity ratio automatically. The intensity ratio (typically between 0.5 and 0.7 for **new standard flow cells** and 0.1 to 0.3 for **new mico- and high pressure cells**) is dependent on the degree of contamination of the flow cell windows, and on the type of flow cell used.

```
Instrument:       G1315C
Serial Number:    PP00000024
Operator:         Wolfgang
Date:             25.02.2005
Time:             14:54:22
File:             C:\CHEM32\2\DIAGNOSE\DAD_CELL2.DGR

                                                                    |    Result | Status
--------------------------------------------------------------------------------------
Detector Cell Test                                                  |           |
Date: 25.02.2005;  Time: 14:54:22                                   |           |
Expected total time: approx. 45 s.                                  |           |
                                                                    |           |
Test Procedure:                                                     |           |
1. If cell not in place, install it                                 |           | done
2. Measuring intensity with cell                                   |     42053 | done
3. Remove cell                                                      |           | done
4. Measuring intensity without cell                                |     42034 | done
5. Calculating intensity ratio                                      |       1.0 | done
```

Figure 73 Cell Test Results (report) with no flow cell inserted

NOTE This test can be used for the standard flow cells only. The nano flow cells will give very low values due to their design.

Test Failed (low ratio value)

Probable Causes

- Absorbing solvent or air bubble in flow cell.
- Dirty or contaminated flow cell.

Suggested Actions

✔ Ensure the flow cell is filled with water, and free from air bubbles.

✔ Exchange the flow cell windows.

Wavelength Verification and Recalibration

The detector uses the alpha (656.1 nm) and beta (486 nm) emission lines of the deuterium lamp for wavelength calibration. The sharp emission lines enable more accurate calibration than is possible with holmium oxide. When verificaation is started, the 1-nm slit is moved into the light path automatically, and the gain is set to zero. To eliminate effects due to absorbing solvents, the test should be done with bubble free degassed HPLC water in the flow cell.

If a deviation is found and displayed, it can be recalibrated by pressing Adjust. The deviations are tracked in the Calibration History (diagnosis buffer in the detector).

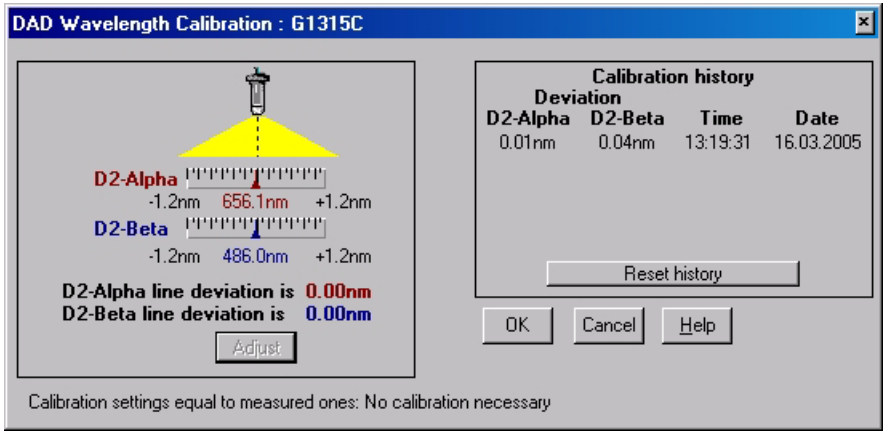


Figure 74 Wavelength Verification and Recalibration

Wavelength calibration should be done

- after maintenance of the flow cell,
- lamp exchange, or
- after a major repair, like processor board or optical unit exchange, see also "Replacing the Detector's Firmware" on page 242.

After calibration, the holmium oxide test (see Figure “Holmium Oxide Test” on page 169) provides verification of wavelength accuracy at three additional wavelengths.

Test Chromatogram

A pre-defined test chromatogram on the detector main board is processed through ADC like normal signals from the diodes and can be used to check the Analog-to-Digital Converter and the data handling system. The signal is available at the analog output and on the LAN.

NOTE The run time of the chromatogram is depending on the setting for response time (peak width). If no stop time is set the chromatogram will repeat continuously.

Table 21 Test Chromatogram Settings (examples)

Response time	Set Run Time
0.1 sec	0.28 min
0.2 sec	0.6 min
0.5 sec	1.2 min
1 sec	2.3 min
2 sec (default)	4.5 min
4 sec	9 min
8 sec	18 min
16 sec	36 min

Table 22 Test Chromatogram - Peak Heights

Peak	Absorbance (approx.)
1	38 mAU
2	100 mAU
3	290 mAU
4	20 mAU

Agilent ChemStation

1 Select the response time and stop time according to Table 21 on page 178.

2 If required, connect a recording device to the analog output.

3 Activate the test chromatogram by typing into the command line (or as pre-run command):

PRINT SENDMODULE$(NDAD,"SIMU:DFLT") for G1315C/D DAD or
PRINT SENDMODULE$(NMWD,"SIMU:DFLT") for G1365C/D MWD

4 Start the run.

On completion of the run, or when the run is stopped, the test chromatogram is deactivate.

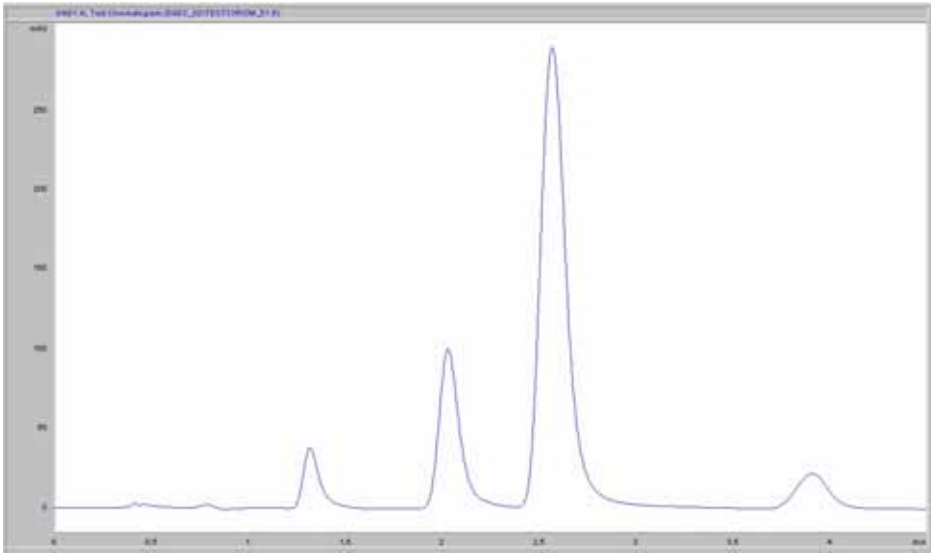


Figure 75 Test Chromatogram on Agilent ChemStation (response time 2 seconds)

Control Module G1323B

1. Select the response time and stop time according to Table 21 on page 178.
2. If required, connect a recording device to the analog output.
3. Select the function Enable test chromatogram in Tests - DAD or MWD and press Execute.
4. Select the Plot button in the System screen and press the Setup button.
5. Select as Source the Signal (DAD or MWD), change the Y-range to - 10 to 300 mAU, fit the Time Range to match Table 21 on page 178and press Done.
6. Press the Start button to start the run.

   On completion of the run, or when the run is stopped, the test chromatogram is deactivated.

Diagnosis Information on Agilent ChemStation

The Agilent ChemStation provides certain information on various assemblies in the detector.

1 Open the Diagnosis and change to detailed view.

2 Click on the assembly of interest and select “Update Variables Display“. Figure 76 on page 182 shows an example.

Table 23 on page 181 lists the assemblies which provide detailed information.

Table 23 Diagnosis - detailed information

Assembly	Details
General	Product number, firmware revision, manufacturing date (of intsrument or, if replaced, of main board), serial number, accumulated on-time, spectrometer serial number.
Vis lamp	Accumulated on-time, actual on-time, lamp switch on, accumulated on time switches, switch on voltage/current, lamp current, lamp voltage/current
UV lamp	Accumulated on-time, actual on-time, lamp ignitions, accumulated on time reset, ignition voltage/current, lamp voltage, lamp voltage/current. **Available with ID-tag lamp only.** product number, serial number, production date, last intensity test
Holmium Filter	Filter movements, filter moves reset log
Flow Cell	**Available with ID-tag flow cells only.** Product number, production date, pathlength, max pressure, serial number, volume, last cell test
Micro Slit	Slit movements, filter moves reset log

Details of UV-lamp with RFID tag

Details of flow cell with RFID tag

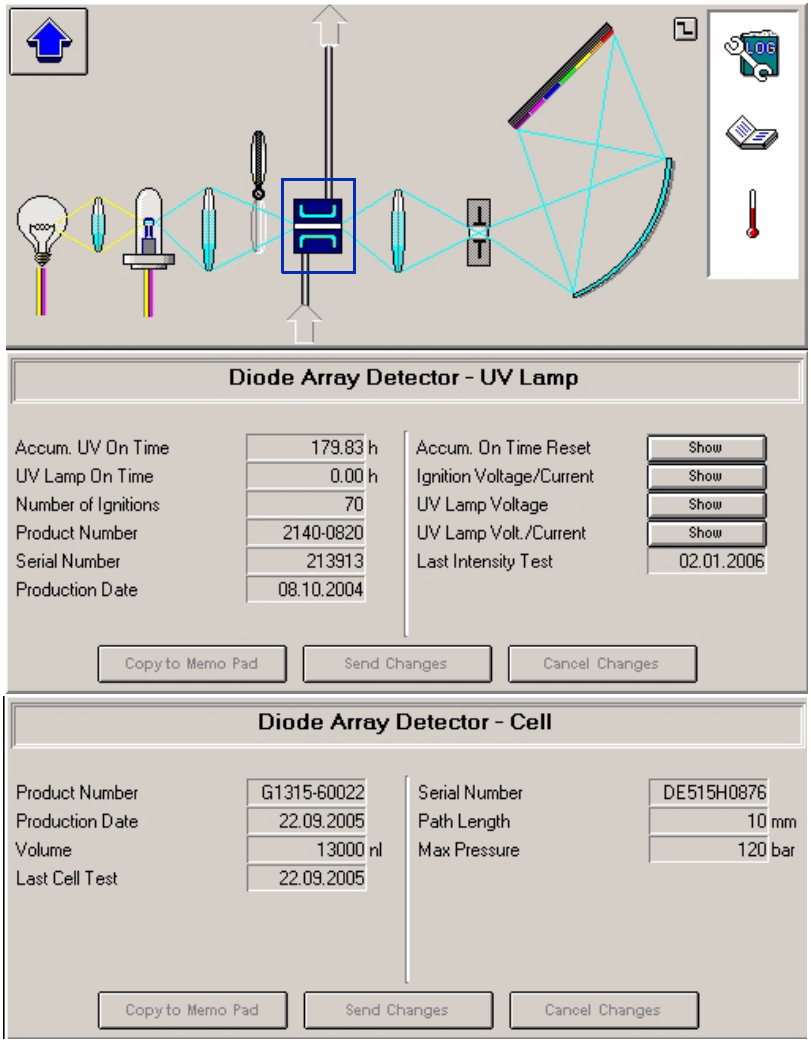


Figure 76 Diagnosis screen in Agilent ChemStation (detailed view)

10
Diagnostic Signals

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Baseline problems deriving from deuterium lamps 185
Wander / Drift Problems Due to Temperature Changes 190
Internal Board Temperature 199

This chapter describes the detector's built in diagnostic signals.

Overview of Diagnostic Signals

The detector has several signals (internal temperatures, voltages and currents of lamps) that can be used for diagnosing problems. These can be

- baseline problems deriving from deuterium lamps
- wander / drift problems due to temperature changes

These signals can be used in addition to the normal baseline signal to determine whether correlation to temperature or voltage/current of the lamp.

Baseline problems deriving from deuterium lamps

Problem Description

With the low noise of the 1200 Series Diode Array Detector (G1315C/D) or Multiple Wavelength Detector (G1365C/D), some deuterium lamps may cause periodic baseline instabilities at the end of lamp life.

NOTE This may only be observed when operating at very sensitive detection levels (see Figure 77 to Figure 79).

Without, or with inappropriate reference wavelength, such lamp instabilities show up as baseline problems even earlier and stronger.

Lamp instabilities come in many different forms. The period may vary from a few seconds to hours. Some extreme examples are shown in Figure 77 to Figure 79.

Problem Verification

If an 1200 Series DAD or MWD shows baseline problems, the following steps to diagnose whether the lamp is the cause of the baseline instability:

1. Ensure that the detector has been properly optimized, see next page.
2. Take the flow cell out of the detector to remove any influence of the flow system.

If the baseline continues to show the problem, the lamp should be replaced.

NOTE If the baseline is stable without cell inserted, look for other possible causes of the problem, for example dirty flow cell, column, sampler, pump, etc.

Solution

Replace the lamp after problem verification.

Table 24 Deuterium lamps used in 1200 series DAD/MWD-detectors

Part Number	Description	usable in
2140-0820	long-life deuterium lamp with RFID tag (black cover)	G1315A/B/C/D, G1365A/B/C/D, G1314A/B/C (see note below) RFID **tag info used in G1315C/D and G1365C/D only**.
2140-0813	long-life deuterium lamp	G1315A/B/C/D, G1365A/B/C/D, G1314A/B/C (see note below)
5181-1530	long-life deuterium lamp (black cover)	G1315A/B/C/D, G1365A/B/C/D, G1314A/B/C (see note below)
2140-0590	standard deuterium lamp	G1315A/B/C/D, G1365A/B/C/D, G1314A/B/C (see note below)

NOTE These lamps can be operated in the Agilent 1200 series variable wavelength detector (G1314A/B/C) as well. For details about changing the configuration and information on the specifications, refer to the Reference Manual of the G1314A/B/C, section “Exchanging a Lamp”.

Optimization Information

To extend the useful life of deuterium lamps in the 1200 Series DAD/MWD, we recommend

1 to turn lamps off over night, or when not used for > 4 hours.

2 to use an appropriate reference wavelength

The above mentioned problem can be reduced by choosing the right wavelength settings. The use of a reference wavelength setting close to the sample wavelength (e.g. sample 254,4, reference 350,100) will reduce the lamp effects, see figures 1 to 3.

During installation/familiarization of an 1200 Series DAD/MWD this optimization hint should be given to the user (as described in the 1200 Series DAD/MWD Reference Manual's Optimization Section.

Examples of baselines

Below are 3 examples of baseline instabilities caused by lamps. Please keep in mind:

- the different forms of the baseline problem. Periods can be a few second to hours.
- the significant reduction of the problem by choosing an appropriate reference wavelength.

Used wavelength settings:

- Window#1 - shows the baseline when a reference wavelength setting of 350,100 would be used (window#2 minus window#3)
- Window#2 - Sample wavelength 250,100; Ref=OFF
- Window#3 - Sample wavelength 350,100; Ref=OFF

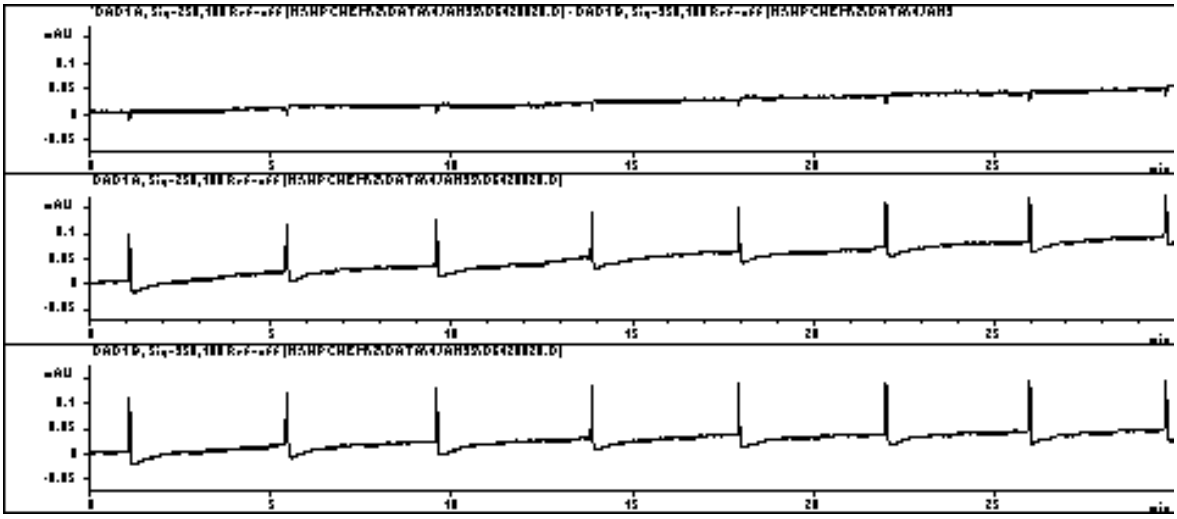


Figure 77 Example with regular appearing spikes

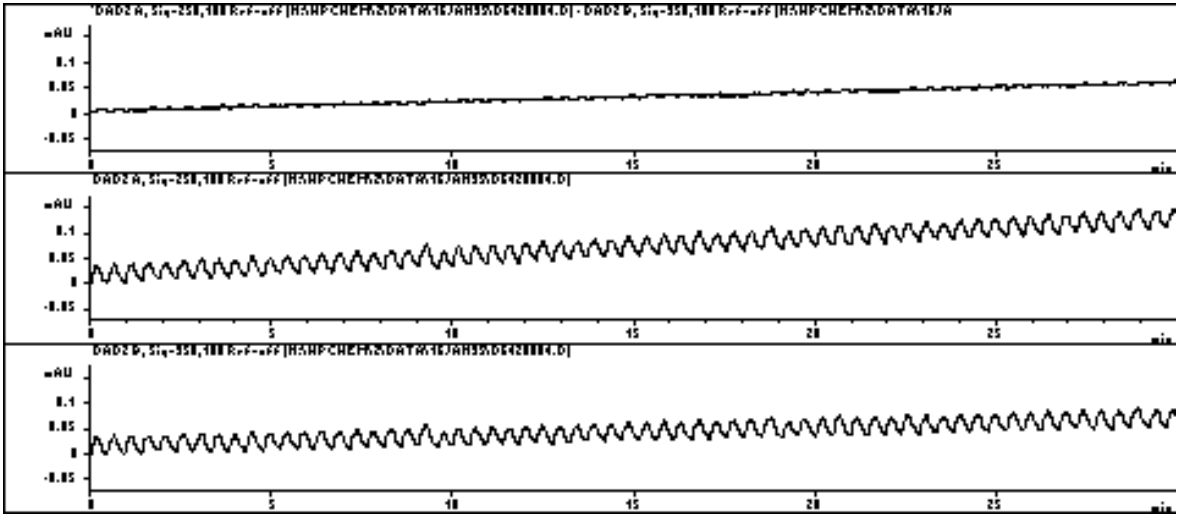


Figure 78 Example that might generate the impression the pumping system is the source problem

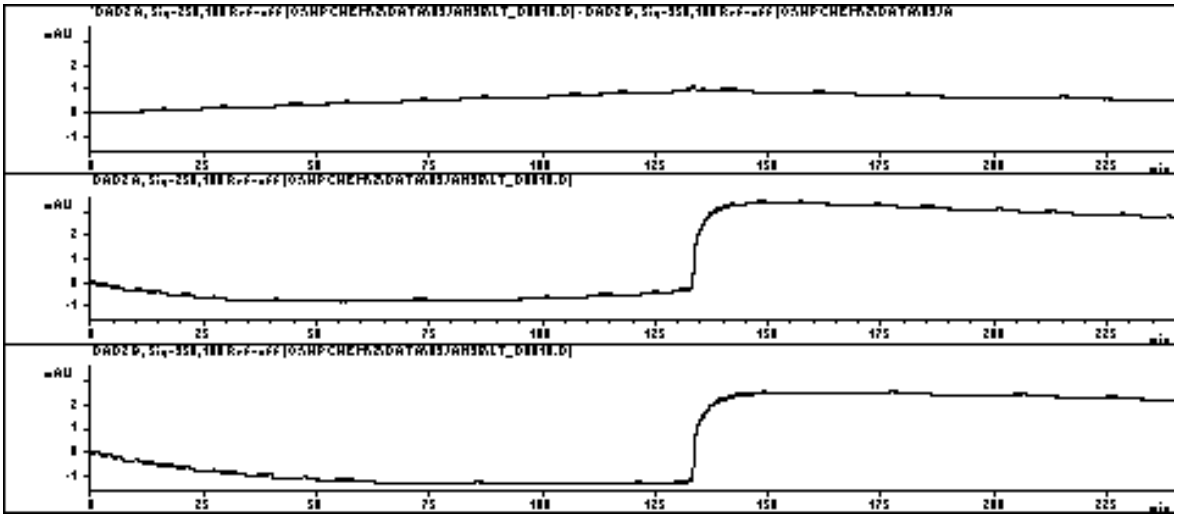
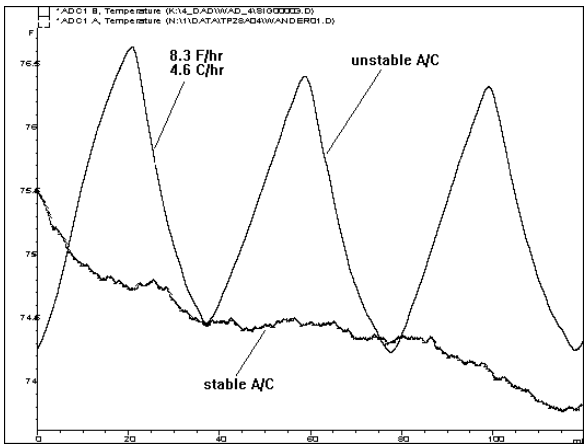


Figure 79 Example of stepping with period > 2 hours

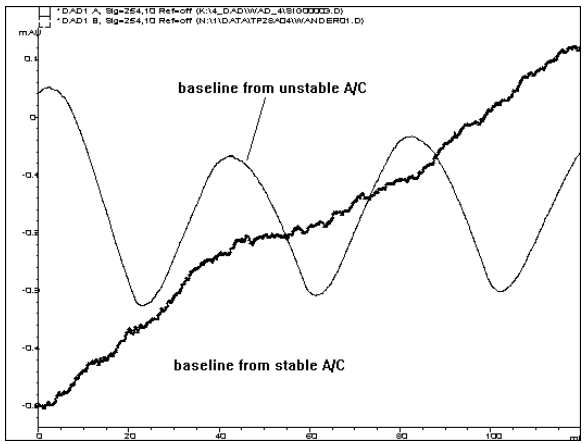
Wander / Drift Problems Due to Temperature Changes

Situation

The most frequent cause of ambient temperature fluctuations are unstable laboratory air conditioning systems. Other causes include direct sunshine or drafts from open doors and windows. These temperature changes cause baseline wander which can make reproducible integration of trace level peaks difficult or impossible.



Temperature Plot -Full scale 4°F (2.2°C), 120 minutes



Baseline Plot based on above temperature plots: Full scale 0.7 mAU, 120 minutes

Figure 80 Wander effects based on instable lab conditions

Specifications and Conditions

Short term noise (ASTM): ± 0.8 x 10^{-5} AU at 254 and 750 nm

Drift: 0.9 x 10^{-3} AU/hr at 254 nm

ASTM: “Standard Practice for Variable Wavelength Photometric Detectors Used in Liquid Chromatography”.

ASTM information can be obtained via internet http://www.astm.org

Reference conditions: cell path length 10 mm

response time 2 s

slit width 4 nm

flow 1 ml/min

HPLC-grade Methanol

ASTM drift tests require a temperature change below 2°C/hour (3.6°F/hour) over one hour period. Our published drift specification is based on these conditions. Larger ambient temperature changes will result in larger drift.

Better drift performance depends on better control of the temperature fluctuations. To realize the highest performance, minimize the frequency and the amplitude of the temperature changes to below 1°C/hour (1.8°F/hour). Turbulences around one minute or less can be ignored.

Principle of Temperature Control

In Figure 81 the principle of temperature control is shown. The fan draws the air in from the rear of the instrument. A heater element heats the air and the air stream blows across the optical unit's casting back to the rear of the instrument. The temperature control mechanism (heater, fan, temperature sensors, processor) assures a stable temperature of the optical unit (approx. 30°C at the flow cell). If the detector environment is far away from normal laboratory temperatures - but inside the allowed ambient operating temperature 0 - 55°C (32 - 131°F) - the setpoint is automatically adapted to a value near this temperature.

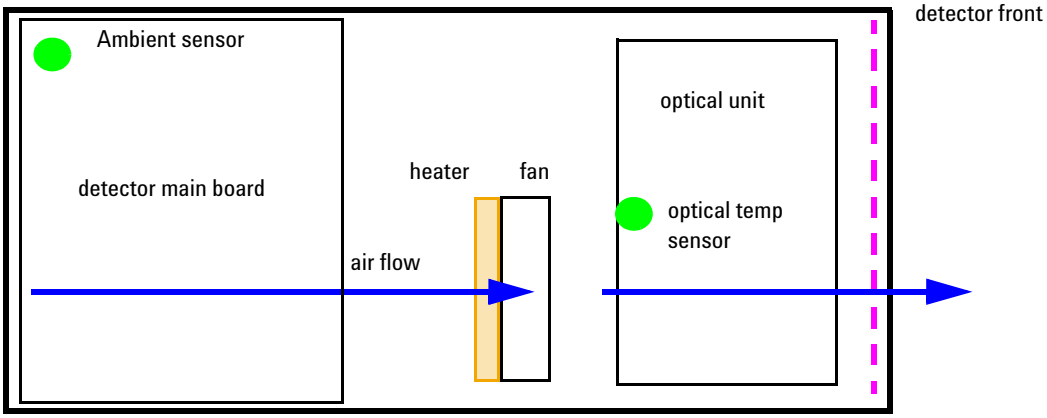


Figure 81 Air flow and sensors in the detector

Warm-up of detector

Give the optical unit enough time to warm-up and stabilize.

The G1315C/D and G1365C/D detector is temperature controlled. After turn-on of the detector, it goes through a cycle of different states, see Figure 82:

- 0 to 0.5 minutes the heater control is OFF and the heater element runs at 0% duty cycle.

- 0.5 to 1 minutes the heater control is OFF and the heater element runs at 66% duty cycle. This first minute is used as self-test of the heater functionality.
- 1 to 30 minutes the heater control is OFF and the heater element runs at 40% duty cycle.
- after 30 minutes the heater control is ON and is working with optimized parameters to get the optical unit into the optimal temperature window stabilized.

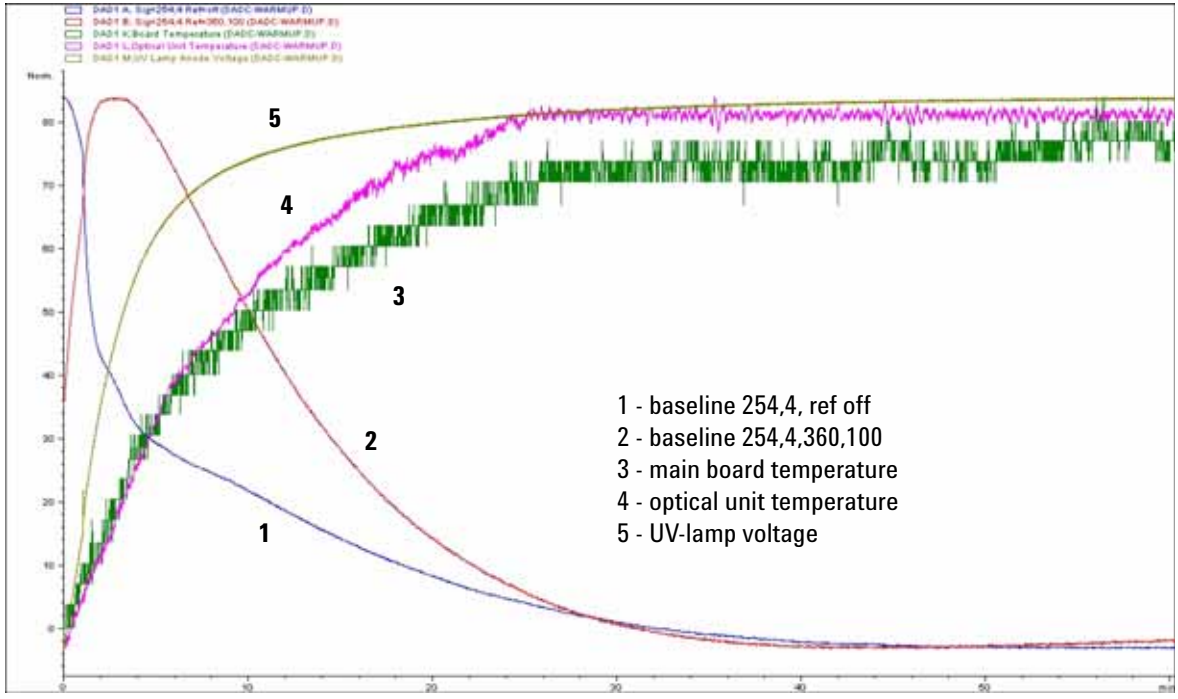


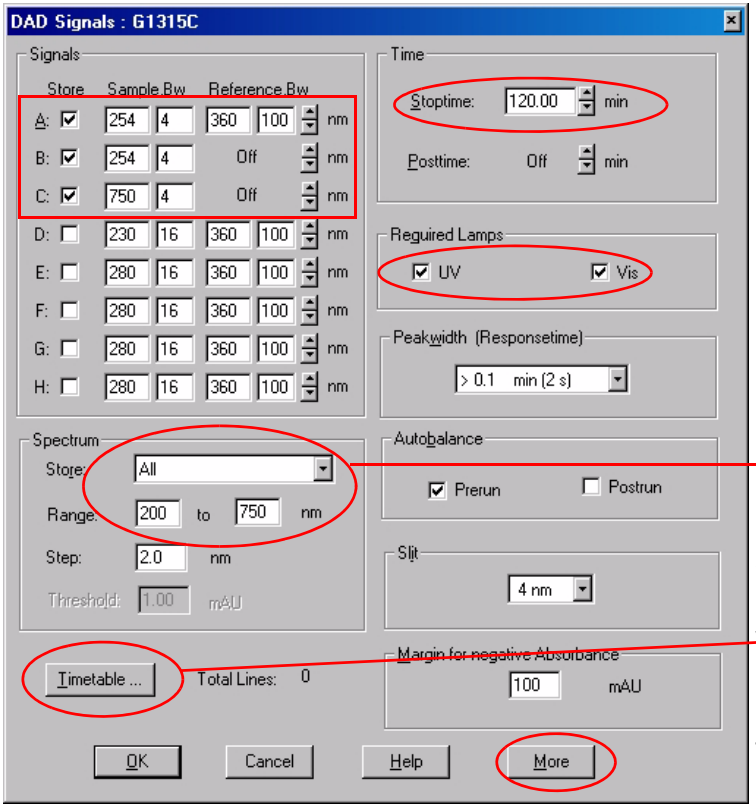
Figure 82 Example of warm-up cycle and corresponding diagnostic signals (detector and both lamps turned on at room temperature of 23°C start run after 4 minutes)

NOTE The times to stabilize the baseline may vary from instrument to instrument and depends on your environment. Above example was done under stable environmental conditions.

Setup of Detector

1 Remove the flow cell to eliminate problems from the flow system.

2 Use the following detector settings (all parameter not mentioned should stay on default values as shown):



Do not run shorter runs than 60 minutes. Typical effects from air condition systems run at cycles of 15 to 20 minutes.

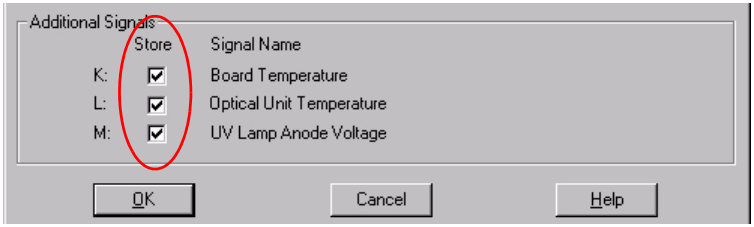
Both lamps should be on.

IMPRORTANT:

For factory evaluations, spectra should be taken as well for at least 1-2 cycles (200-750nm).

You may use a time table for this.

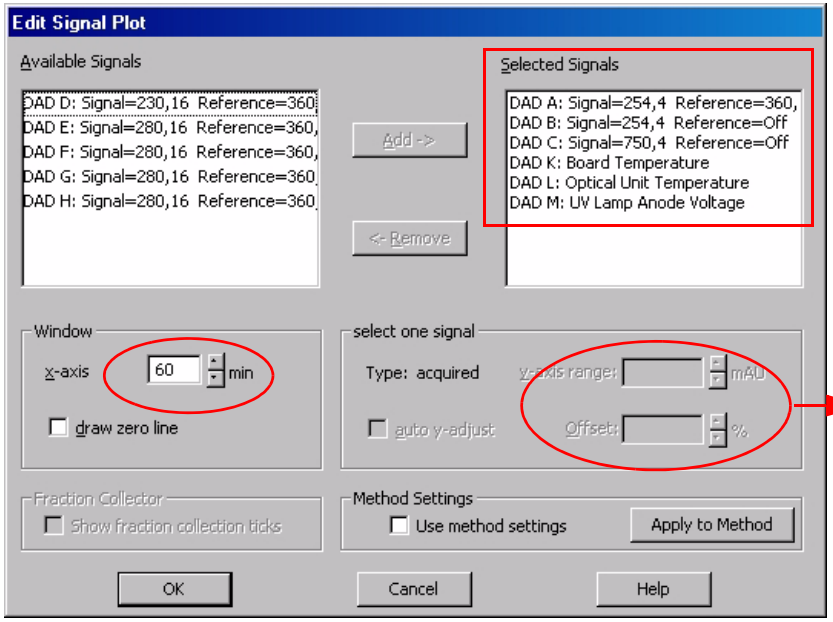
The ‘More’ button opens the additional diagnostic signals.



For temperature related problems at least Board Temperature and Optical Unit Temperature signals are required.

Figure 83 Setting up the detector

3 In the ChemStation Online Plot window select the following signals and use the settings according the table:



Signal	Y-range	Offset
A	2	10
B	2	20
C	2	30
K	20	40
L	20	50
M	5	60

Figure 84 Selecting online plot signals

4 Let the detector equilibrate for about 30 to 60 minutes.

NOTE The Y-range for signals A, B, C and M may require higher values when the lamps have been turned on.

Start a Run and Evaluate

1 Start baseline runs for 1 to 2 hours (during the time where the user experiences the problems).

NOTE Do not run shorter runs. Typical effects from air condition systems run at cycles of 15 to 20 minutes.

2 Look for a correlation between the temperature signal and the baseline. If you see no correlation to the temperature signal, see also "Baseline problems deriving from deuterium lamps" on page 185.

3 Determine the rate of temperature change.

4 Look for trends which prevail for 5 minutes or longer. Turbulences around one minute or less can be ignored.

Figure 85 shows an example, where the detector's temperature control is ON (normal operation). The ambient temperature of 25 degree C varies by +/- 2 degree C. The baseline is stable.

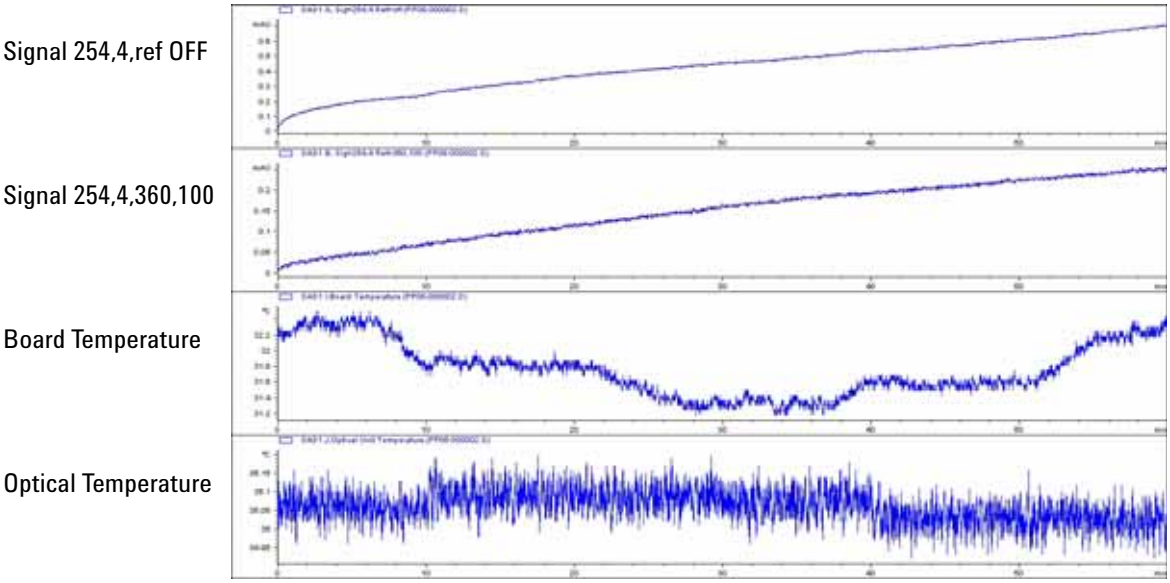


Figure 85 Example plot (optical unit temperature control ON)

Figure 86 shows an example, where the detector's temperature control has been turned off (no regulation). The ambient temperature of 25 degree C varies by +/- 2 degree C. The baseline is instable.

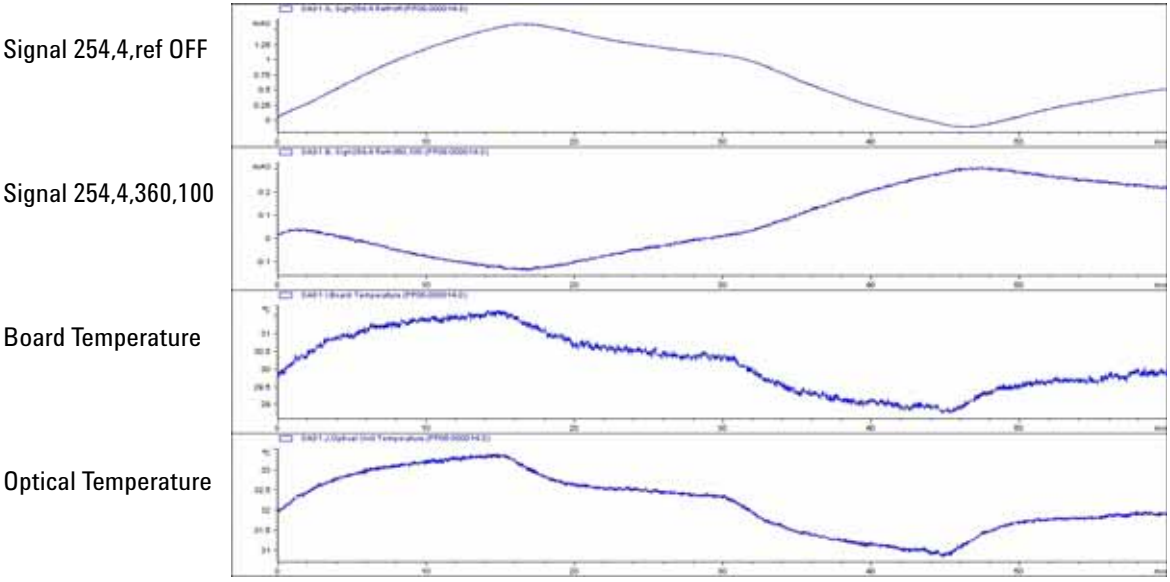
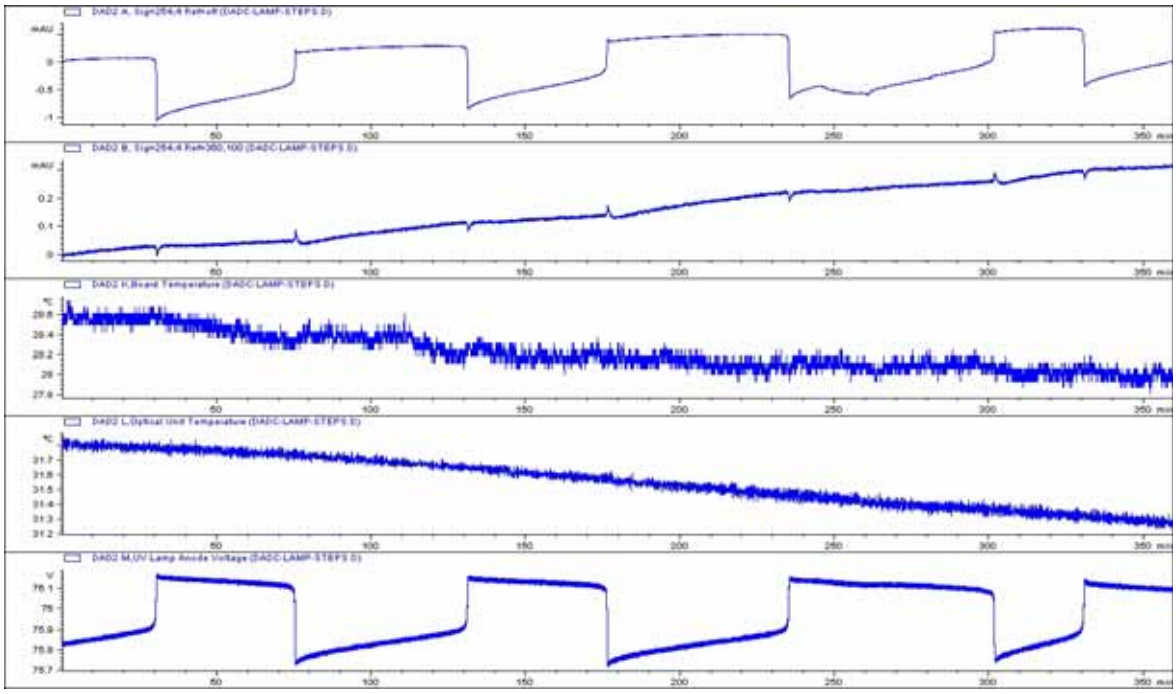


Figure 86 Example plot (optical unit temperature control OFF)

Figure 87 on page 198 shows an example, where the UV-lamp is periodically stepping. There is no correlation visible on the temperature signals. Therefore it is a lamp problem.



Signals top to bottom:
1 - baseline 254,4, ref off
2 - baseline 254,4,360,100
3 - main board temperature
4 - optical unit temperature
5 - UV-lamp voltage

Figure 87 Example plot (Lamp is stepping)

Internal Board Temperature

An on-board temperature sensor on the detctor main board provides the actual temperature on the board. This information is running continuously into a buffer from which it can be retrieved as last-12-hours plot.

Agilent ChemStation: Diagnosis - Detector Details view - Temperature History

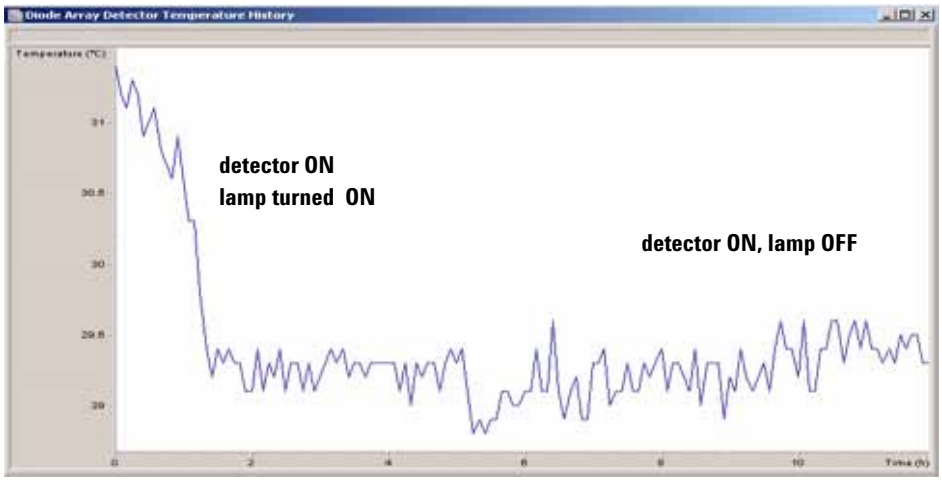


Figure 88 Board Temperature (internal detector buffer)

11
Maintenance and Repair

Introduction to Maintenance and Repair 202
Warnings and Cautions 203
Cleaning the Detector 204
Using the ESD Strap 205

This chapter provides general information on repairing the detector.

Introduction to Maintenance and Repair

Simple Repairs - Maintenance

The detector is designed for easy repair. The most frequent repairs such as lamp change and flow cell change can be done from the front of the detector with the detector in place in the system stack. These repairs are described in "Maintenance" on page 207 (**part of the *User Manual* and *Service Manual***).

Exchanging Internal Parts - Repair

Some repairs may require exchange of defective internal parts. Exchange of these parts requires removing the detector from the stack, removing the covers, and disassembling the detector. The security lever at the power input socket prevents that the detector cover is taken off when line power is still connected. These repairs are described in "Repairs" on page 251 (**part of the *Service Manual***).

Warnings and Cautions

WARNING **To prevent personal injury, the power cable must be removed from the instrument before opening the detector cover. Do not connect the power cable to the detector while the covers are removed.**

WARNING **To prevent personal injury, be careful when getting in contact with sharp metal areas.**

WARNING **When working with solvents please observe appropriate safety procedures (for example, goggles, safety gloves and protective clothing) as described in the material handling and safety data sheet supplied by the solvent vendor, especially when toxic or hazardous solvents are used.**

CAUTION Electronic boards and components are sensitive to electrostatic discharge (ESD). In order to prevent damage always use an ESD protection when handling electronic boards and components (see "Using the ESD Strap" on page 205).

WARNING **Eye damage may result from directly viewing the light produced by the deuterium lamp used in this product. Always turn the deuterium lamp off before removing it.**

Cleaning the Detector

The detector case should be kept clean. Cleaning should be done with a soft cloth slightly dampened with water or a solution of water and mild detergent. Do not use an excessively damp cloth allowing liquid to drip into the detector.

WARNING **Do not let liquid drip into the detector. It could cause shock hazard and it could damage the detector.**

Using the ESD Strap

Electronic boards are sensitive to electrostatic discharge (ESD). In order to prevent damage, always use an ESD strap when handling electronic boards and components.

1 Unwrap the first two folds of the band and wrap the exposed adhesive side firmly around your wrist.

2 Unroll the rest of the band and peel the liner from the copper foil at the opposite end.

3 Attach the copper foil to a convenient and exposed electrical ground.

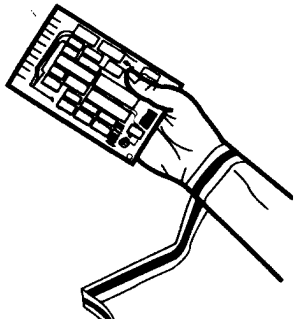


Figure 89 Using the ESD Strap

12
Maintenance

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This chapter describes the maintenance of the detector.

Overview of Maintenance

The following pages describe maintenance (simple repairs) of the detector that can be carried out without opening the main cover.

Table 25 Overview of Maintenance

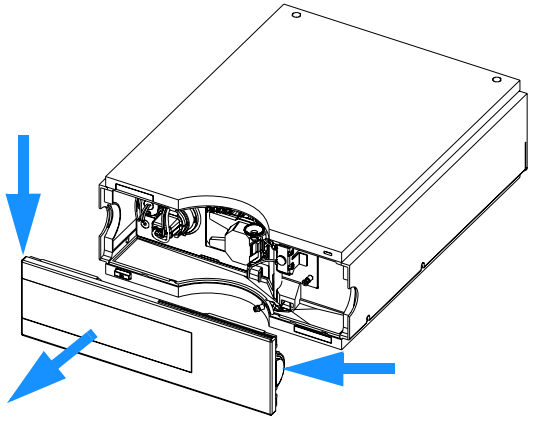
Procedure	Typical Frequency	Notes
Deuterium lamp or tungsten lamp exchange	If noise and/or drift exceeds your application limits or lamp does not ignite.	An intensity test should be performed after replacement.
Flow cell exchange	If application requires a different flow cell type.	A holmium or wavelength calibration test should be performed after replacement.
Flow cell parts Cleaning or exchange	If leaking or if intensity drops due to contaminated flow cell windows.	A pressure tightness test should be done after repair.
Holmium oxide filter Cleaning or exchange	If contaminated.	A holmium or wavelength calibration test should be performed after replacement.
Leak sensor drying	If leak has occurred.	Check for leaks.
Leak handling System replacement	If broken or corroded.	Check for leaks.

Exchanging a Lamp

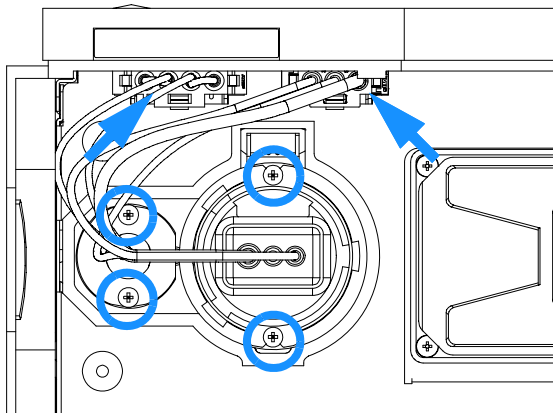
When required	If noise or drift exceeds application limits or lamp does not ignite
Tools required	Screwdriver POZI 1 PT3
Parts required	Longlife Deuterium lamp “C“ 2140-0820 (with black cover and RFID tag) Tungsten lamp G1103-60001
Preparations	Turn the lamp(s) off.

CAUTION If the detector has been in use, the lamp may be hot. If so, wait five minutes until lamp cools down.

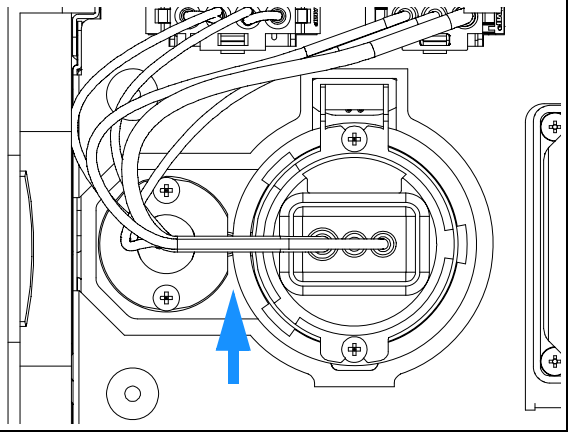
1 Press the release buttons and remove the front cover to have access to the lamp area.



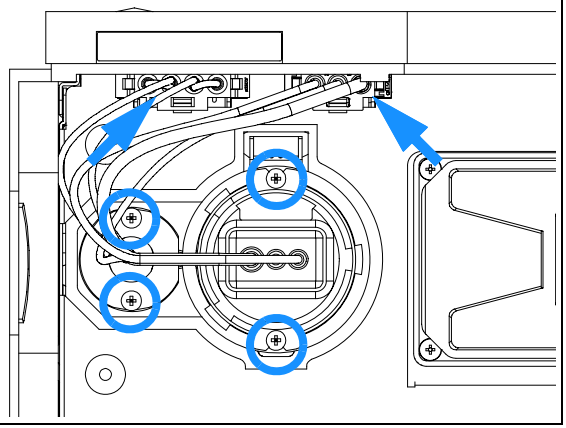
2 Disconnect lamp from the connector, unscrew the Vis-lamp (left) and/or UV-lamp (right) and remove the lamp. Do not touch the glass bulb with your fingers.



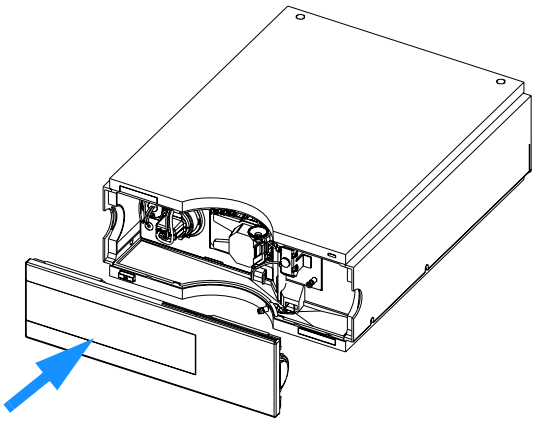
3 When replacing the Vis-lamp, assure that the Vis-lamp is inserted as shown (flat edge towards the deuterium lamp).



4 Insert the lamp. Fix the screws and reconnect the lamp to connector.



5 Replace the front cover.



Next steps:

6 Reset the lamp counter as described in the user interface documentation (lamps with RFID tag cannot be reset).

7 Turn the lamp on and give the lamp 10 minutes to warm up.

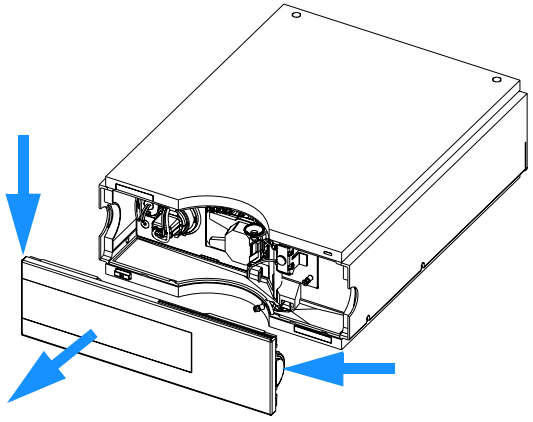
8 Perform a "Wavelength Verification and Recalibration" on page 246 or a "Holmium Oxide Test" on page 247 to check the correct positioning of the UV-lamp.

9 Perform an "Intensity Test" on page 167.

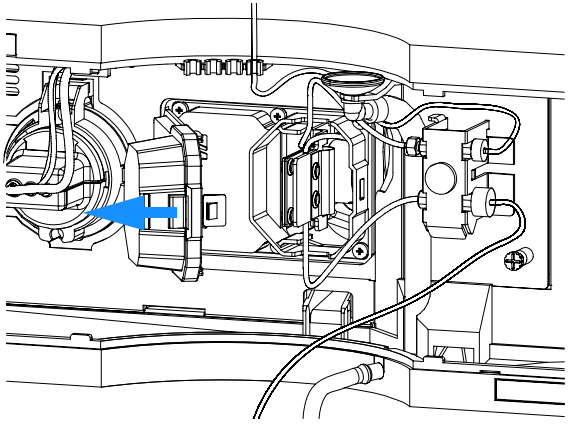
Exchanging a Flow Cell

When required	If an application needs a different type of flow cell or the flow cell needs repair.
Tools required	Two 1/4 inch wrenches for capillary connections
Parts required	Standard flow cell, 10 mm, 13 µl, 120 bar, G1315-60022 Semi-micro flow cell, 6 mm, 5 µl, 120 bar, G1315-60025 Micro flow cell, 3 mm, 2 µl, 120 bar, G1315-60025 High pressure flow cell, 6 mm, 1.7 µl, 400 bar, G1315-60015 Nano flow cell, refer to "Nano Flow Cell - Replacing or Cleaning" on page 231
Preparations	Turn the lamp(s) off. Remove the front cover.

1 Press the release buttons and remove the front cover to have access to the flow cell area.



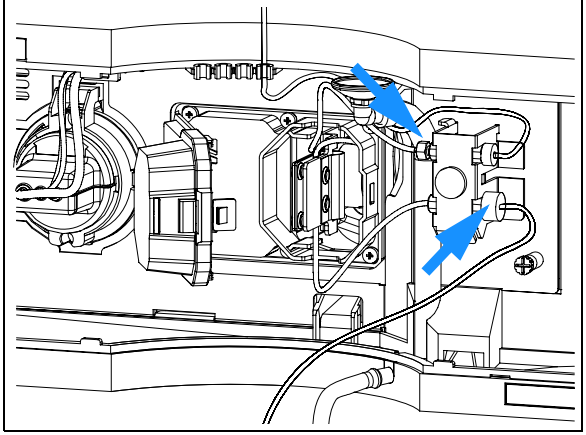
2 Open the flow cell cover.



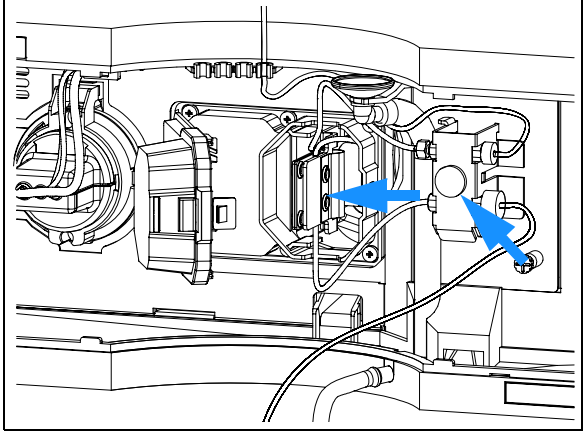
Note:

Depending on the system setup, the inlet capillary might be routed directly from the module above or below to the cell and not to the capillary holder.

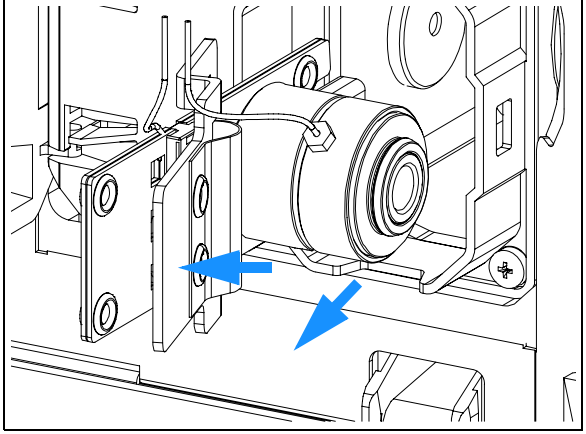
3 Disconnect the flow cell inlet capillary (top) and the waste tubing (bottom) from the unions.



4 Loosen the thumb screw and remove the flow cell outlet capillary (bottom) with the union.



5 Remove the flow cell while pressing the flow cell holder.

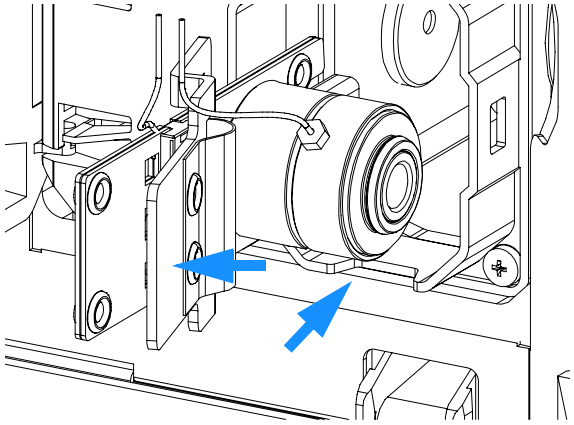


Note:

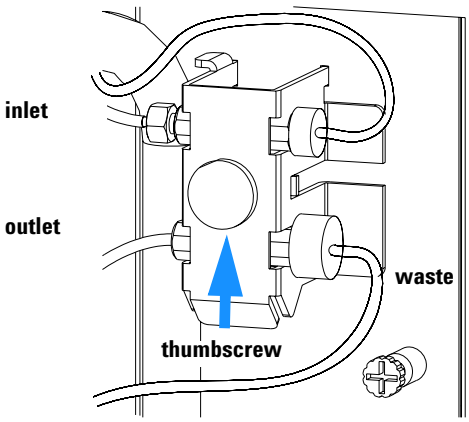
The label attached to the flow cell provides information on part number, path length, volume and maximum pressure.

If you want to replace flow cell parts, see "Maintenance of Standard, Semi-Micro or Micro Flow Cell" on page 214 or "Maintenance of High Pressure Flow Cell" on page 219.

6 Insert the flow cell while pressing the flow cell holder.



7 Insert the flow cell capillaries into the union holder (top is inlet, bottom is outlet). Tighten the thumb screw and Reconnect the waste tubing (bottom) to the union.



Note:

To check for leaks, establish a flow and observe the flow cell (outside of the cell compartment) and all capillary connections.

Next steps:

8 Perform a "Wavelength Verification and Recalibration" on page 246 or "Holmium Oxide Test" on page 247 to check the correct positioning of the flow cell.

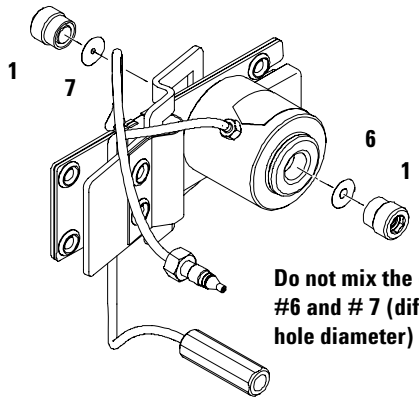
9 Replace the front cover.

Maintenance of Standard, Semi-Micro or Micro Flow Cell

When required	If the flow cell needs repair due to leaks or contaminations (reduced light throughput)
Tools required	Two 1/4 inch wrenches for capillary connections hexagonal key 4 mm Tooth picks
Parts required	For parts, see "Standard Flow Cell" on page 307, "Semi-Micro Flow Cell" on page 309 or "Micro Flow Cell" on page 311.
Preparations	Turn the flow off. Remove the front cover. Remove the flow cell, see "Exchanging a Flow Cell" on page 211.

NOTE The gaskets used in the standard and semi-micro/micro flow cell are different.

1 Use a 4 mm hex key to unscrew the window assembly [1] and remove the gasket [2] from the cell body.



Note:

If you want to replace the gasket only, continue with step 7.

Do not mix the gasket #6 and # 7. They are different for standard and semi-micro flow cell.

2 Use a tooth pick to remove the quartz window from the window assembly (push through from the screw side).

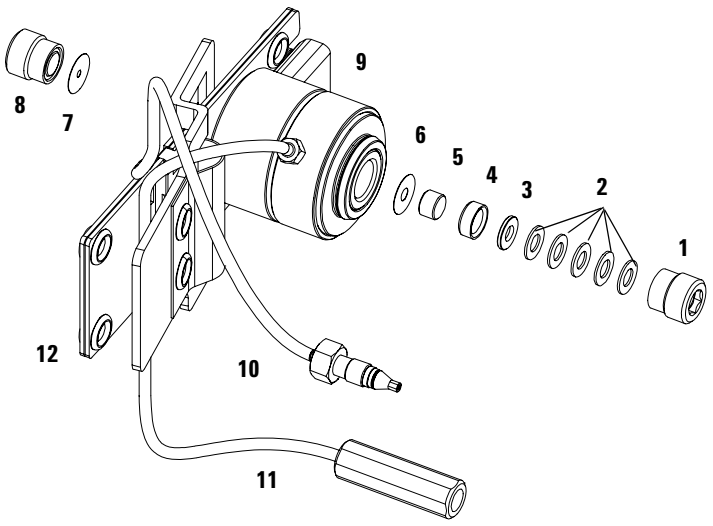
Note:

If the washers fall out of the window assembly, they must be inserted in the correct order with the Teflon® ring to prevent any leaks from the flow cell window.

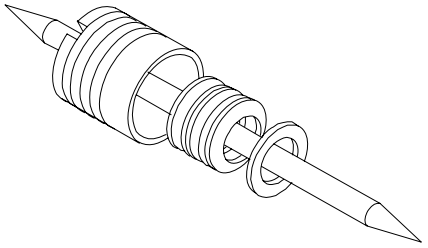
Orientation of Flow Cell Parts

NOTE
Gaskets # 6 and #7 have different hole diameters

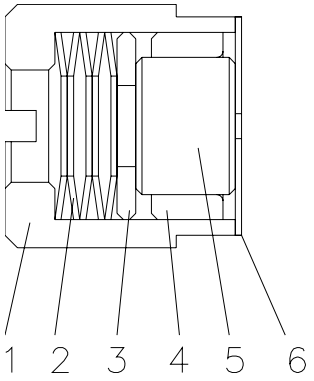
1 - window screw
2 - spring washers
3 - compression washer
4 - window holder
5 - quartz window
6 - gasket (light in)
7 - gasket (light out)
8 - window screw (contains items 2, 3, 4 and 5)
9 - flow cell body
10 - inlet capillary
11 - outlet capillary
12 - holder



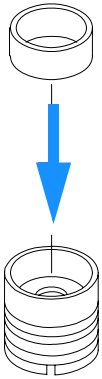
3 Assemble the washers and the window assembly in correct order.



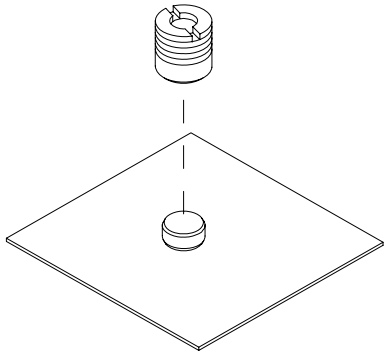
4 Correct orientation of spring washers [2] is required.



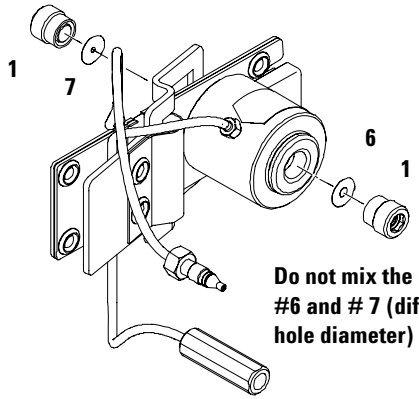
5 Press the Teflon® ring into the window assembly.



6 Press the window assembly onto the new or cleaned quartz window.



7 Insert a new gasket [6, 7] and the window assembly [1] into the cell body. Assure, that the gasket is on the bottom.



8 Using a 4-mm hex key, tighten the window screw hand tight plus a quarter turn.

Next steps:

9 Reconnect the capillaries, see "Exchanging a Flow Cell" on page 211.

10 Perform a leak test.

11 Insert the flow cell.

12 Replace the front cover.

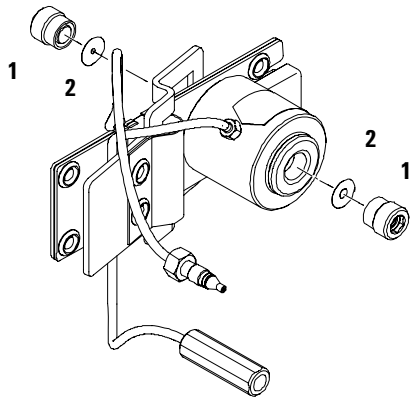
13 Perform a "Wavelength Verification and Recalibration" on page 246 or a "Holmium Oxide Test" on page 247 to check the correct positioning of the flow cell.

Maintenance of High Pressure Flow Cell

When required	If the flow cell needs repair due to leaks or contaminations (reduced light throughput)
Tools required	Two 1/4 inch wrenches for capillary connections hexagonal key 4 mm Tooth picks
Parts required	For parts see "High Pressure Flow Cell" on page 313
Preparations	Turn the flow off. Remove the front cover. Remove the flow cell, see "Exchanging a Flow Cell" on page 211.

NOTE All descriptions in this procedure are based on the default orientation of the cell (as it is manufactured). The heat exchanger/capillary and the cell body can be fixed mirror symmetrically to have both capillaries routed to the bottom or to the top (depending on the routing of the capillaries to the column)

1 Use a 4 mm hex key to unscrew the window assembly [1] and remove the gasket [2] from the cell body.



If you want to replace the gasket only, continue with step 7 on page 217.

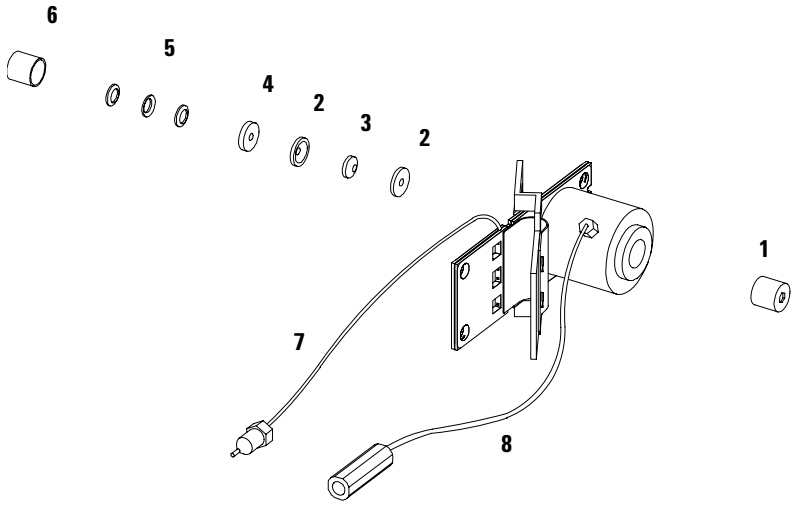
2 Use a tooth pick to remove the quartz window from the window assembly.

Note:

If the washers fall out of the window assembly, they must be inserted in the correct order with the Teflon® ring to prevent any leaks from the flow cell window.

Orientation of Flow Cell Parts

1 - window assembly (contains items 2, 3, 4, 5 and 6
2 - seal ring
3 - quartz window
4 - compression washer
5 - spring washers
4 - window holder
6 - window screw
7 - inlet capillary
8 - outlet capillary



3 Follow the procedure "Maintenance of Standard, Semi-Micro or Micro Flow Cell" on page 214 for reassembling.

Replacing Capillaries on a Standard Flow Cell

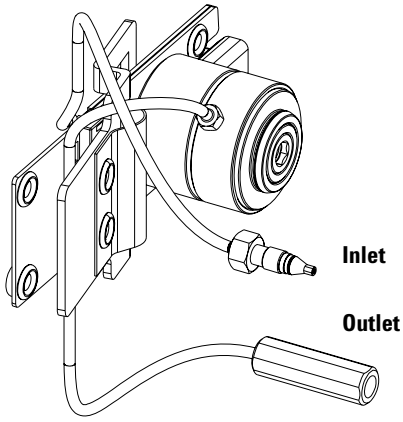
When required	If the capillary is blocked
Tools required	Two 1/4 inch wrenches for capillary connections Wrench 4 mm for capillary connections Screwdriver Pozi 1 PT3
Parts required	For parts see "Standard Flow Cell" on page 307
Preparations	Turn the lamp(s) off. Remove the front cover. Remove the flow cell, see "Exchanging a Flow Cell" on page 211.

NOTE All descriptions in this procedure are based on the default orientation of the cell (as it is manufactured). The heat exchanger/capillary and the cell body can be fixed mirror symmetrically to have both capillaries routed to the bottom or to the top (depending on the routing of the capillaries to the column).

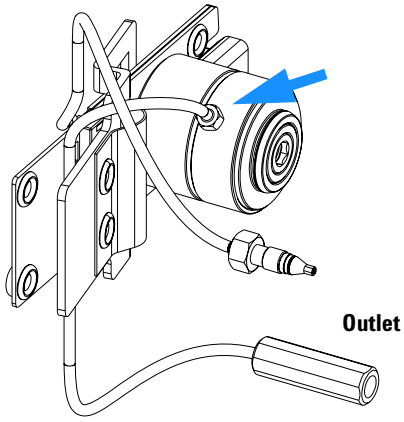
NOTE The fittings at the flow cell body are special types for low dead volumes and not compatible with other fittings.

When retightening the fittings, make sure that they are carefully tightened (handtight plus 1/4 turn with a wrench). Otherwise damage of the flow cell body or blockage may result.

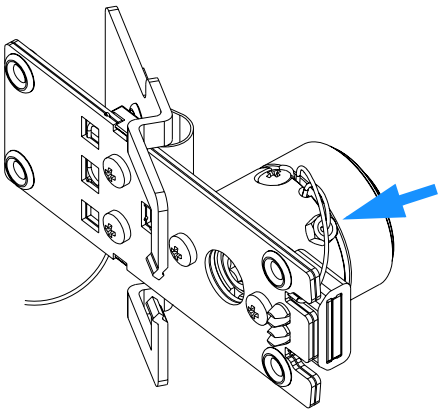
1 Identify the inlet and outlet capillaries. To replace the inlet capillary, continue with step 3.



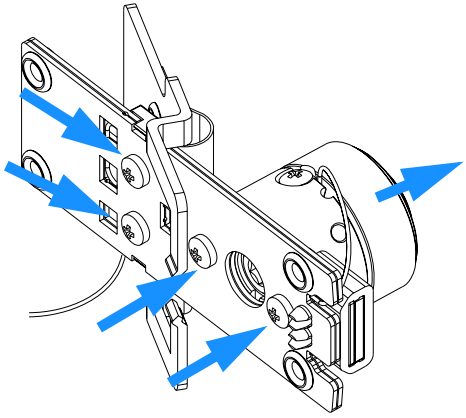
2 After replacing the outlet capillary, fix it handtight first. Then do a 1/4 turn with a 4-mm wrench.



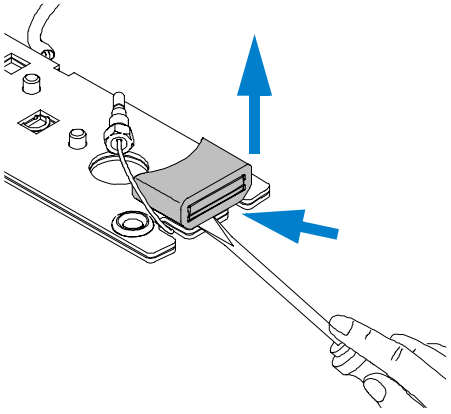
3 To replace the inlet capillary, use a 4-mm wrench for the fitting.



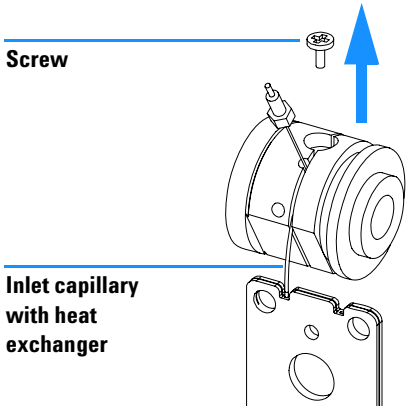
4 Unscrew the cell body from the heat exchanger and the heat exchanger from the clamp unit.



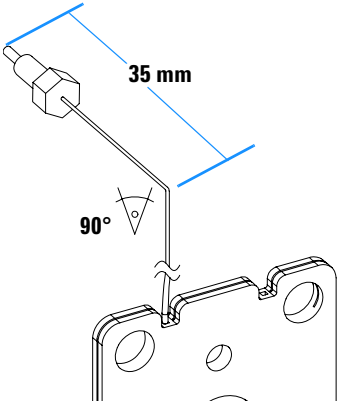
5 Use a small flat screw driver to carefully lift off the RFID tag. Shown is the default orientation. See Note on page 219.



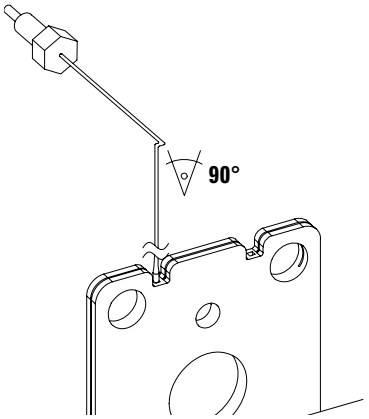
6 Unscrew the fixing screw and unwrap the inlet capillary from the grove in the flow cell body.



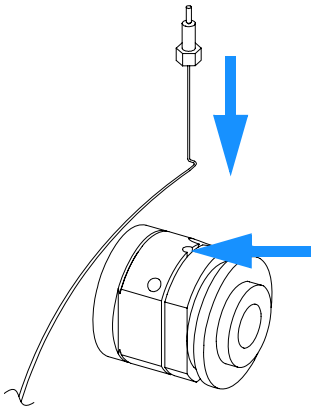
7 Take the new inlet capillary and bend it 90° about 35 mm from its end.



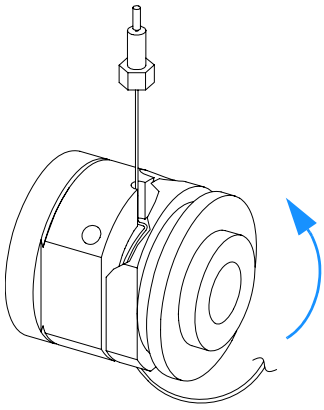
8 Bend the capillary again by 90° as shown below.



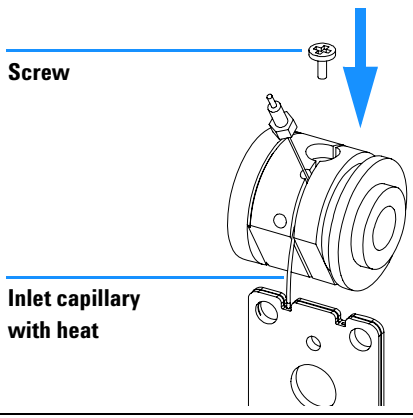
9 Insert the capillary into the hole between fixing screw and the inlet fitting..



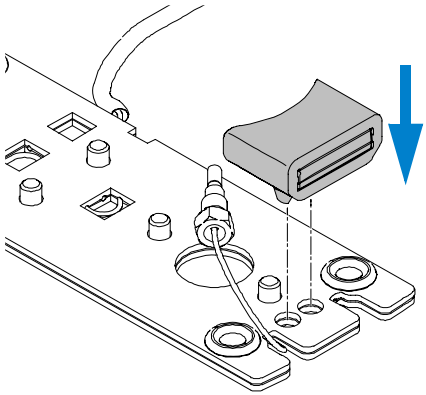
10 The capillary lays in the grove and should be tied around the body (in the grove) 5 times.



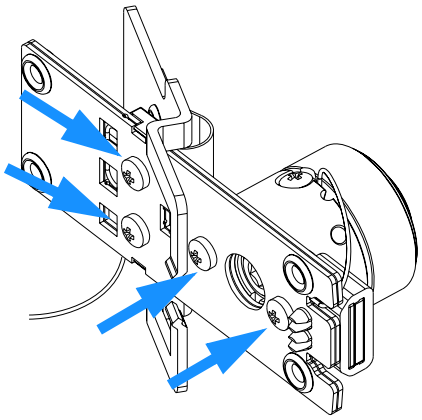
11 Insert the fixing screw, so that the capillary cannot leave the grove.



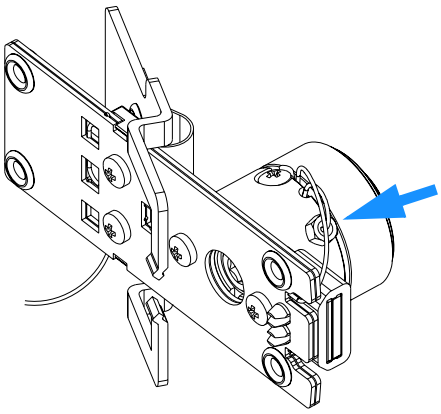
12 Carefully insert the RFID tag into the new heat exchanger. Shown is the default orientation. See Note on page 219.



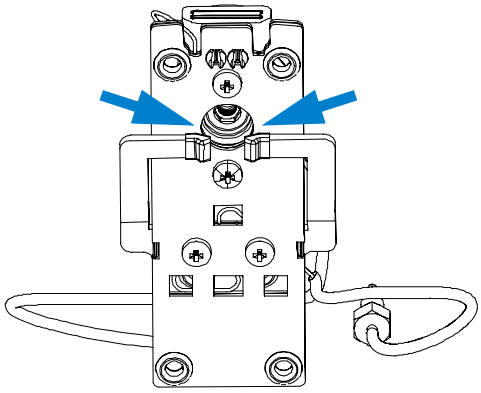
13 Fix the heat exchanger to the clamp unit and the flow cell body to the heat exchanger..



14 Fix the inlet capillary to the flow cell body handtight first. Then do a 1/4 turn with a 4-mm wrench.



15 Check for a centered holder vs. hole. If required adjust with the holder screws.



Next steps:

16 Reconnect the capillaries, see "Exchanging a Flow Cell" on page 211.

17 Perform a leak test.

18 Insert the flow cell.

19 Replace the front cover.

20 Perform a "Wavelength Verification and Recalibration" on page 246 or a "Holmium Oxide Test" on page 247 to check the correct positioning of the flow cell.

Replacing Capillaries on a Semi-Micro, Micro and High Pressure Flow Cell

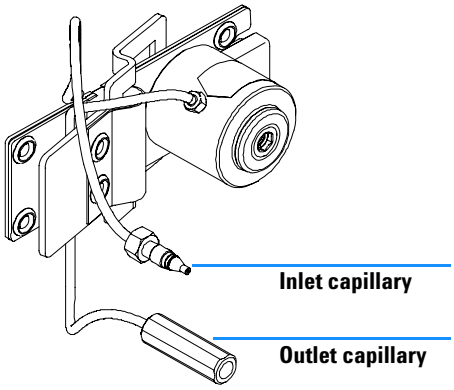
When required	If the capillary is blocked
Tools required	Two 1/4 inch wrenches for capillary connections Wrench 4 mm for capillary connections Screwdriver Pozi 1 PT3
Parts required	For parts see"Semi-Micro Flow Cell" on page 309, "Micro Flow Cell" on page 311 or "High Pressure Flow Cell" on page 313.
Preparations	Turn the lamp(s) off. Remove the front cover. Remove the flow cell, see "Exchanging a Flow Cell" on page 211.

NOTE All descriptions in this procedure are based on the default orientation of the cell (as it is manufactured). The heat exchanger/capillary and the cell body can be fixed mirror symmetrically to have both capillaries routed to the bottom or to the top (depending on the routing of the capillaries to the column).

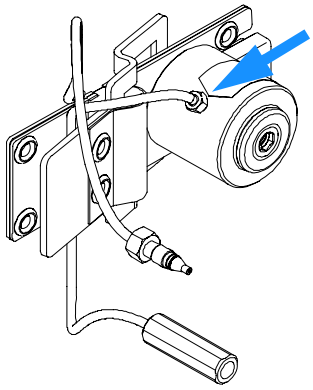
NOTE The fittings at the flow cell body are special types for low dead volumes and not compatible with other fittings.

When retightening the fittings, make sure that they are carefully tightened (handtight plus 1/4 turn with a wrench). Otherwise damage of the flow cell body or blockage may result.

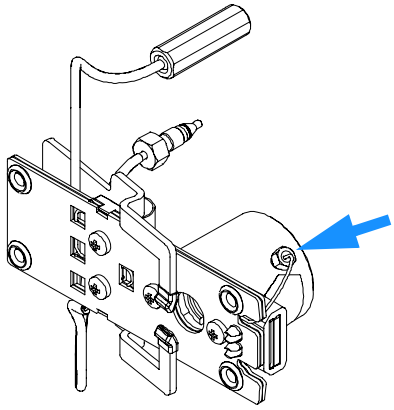
1 Identify the inlet and outlet capillaries.



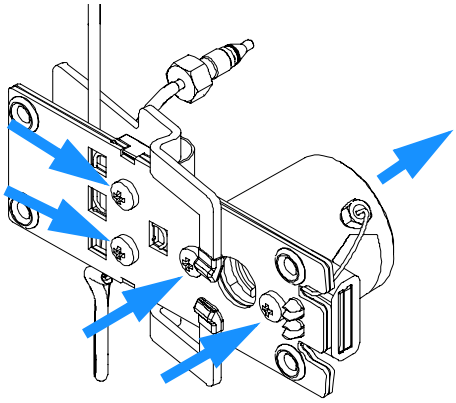
2 After replacing the outlet capillary, fix it handtight first. Then do a 1/4 turn with a 4-mm wrench.



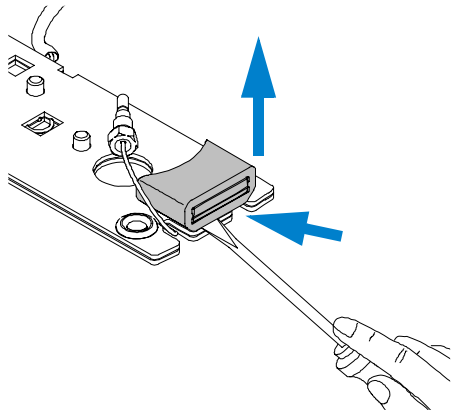
3 To replace the inlet capillary, use a 4-mm wrench for the fitting.



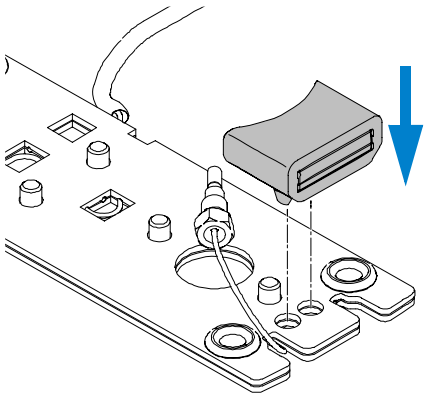
4 Unscrew the cell body from the heat exchanger and the heat exchanger from the clamp unit.



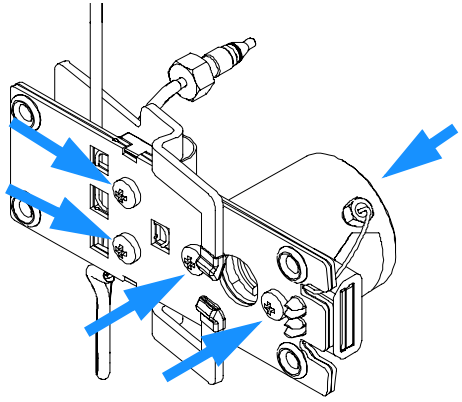
5 Use a small flat screw driver to carefully lift off the RFID tag. Shown is the default orientation. See Note on page 219.



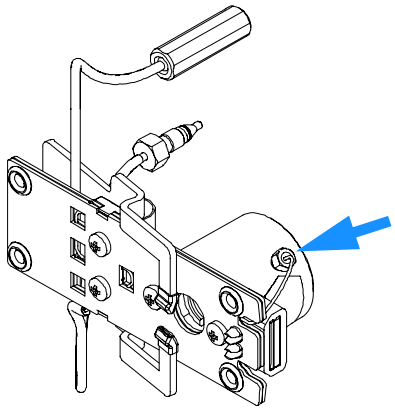
6 Carefully insert the RFID tag into the new heat exchanger. Shown is the default orientation. See Note on page 219.



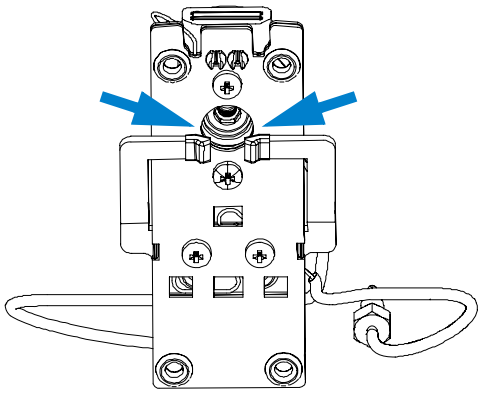
7 Fix the new heat exchanger to the clamp unit and the heat exchanger to the cell body.



8 Fix the inlet capillary to the flow cell body handtight first. Then do a 1/4 turn with a 4-mm wrench.



9 Check for a centered holder vs. hole. If required adjust with the holder screws.



Next steps:

10 Reconnect the capillaries, see "Exchanging a Flow Cell" on page 211.

11 Perform a leak test.

12 Insert the flow cell.

13 Replace the front cover.

14 Perform a "Wavelength Verification and Recalibration" on page 246 or a "Holmium Oxide Test" on page 247 to check the correct positioning of the flow cell.

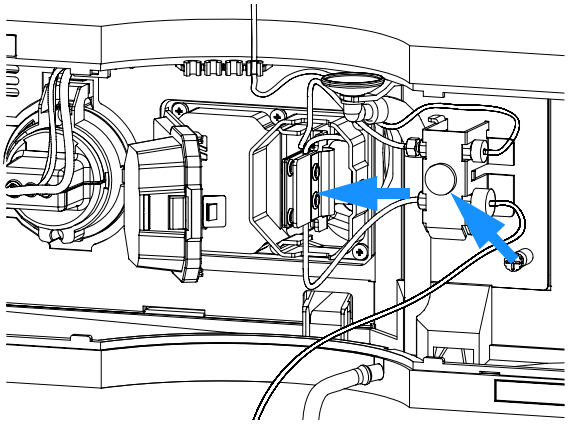
Nano Flow Cell - Replacing or Cleaning

When required	If parts are contaminated or leaky.
Tools required	Screwdriver POZI 1 PT3 Two 1/4 inch wrenches for capillary connections
Parts required	For parts identification refer to "Nano Flow Cells" on page 319 (80 nl and 500 nl).
Preparations	Turn the lamp(s) off. Remove the front cover. Remove the flow cell, see "Exchanging a Flow Cell" on page 211.

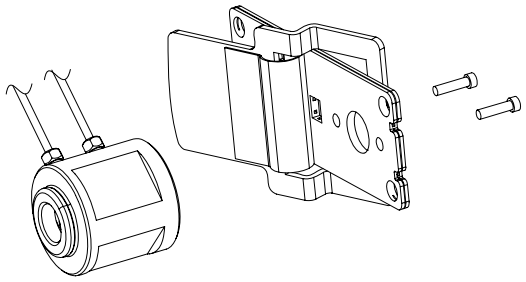
NOTE For details refer to the technical note that comes with the nano-flow cell kit.

NOTE The quartz block can be cleaned with alcohol. DO NOT touch the inlet and outlet windows at the quartz block.

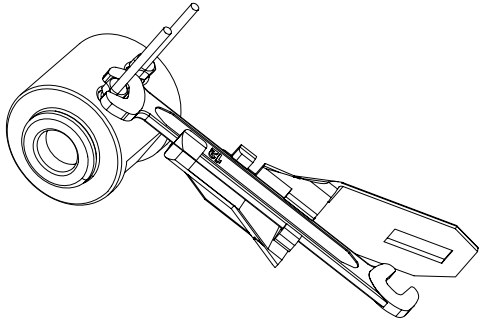
1 Disconnect the capillaries from the capillary holder and remove the flow cell.



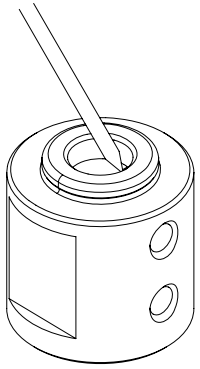
2 Unscrew the cell body from the holder.



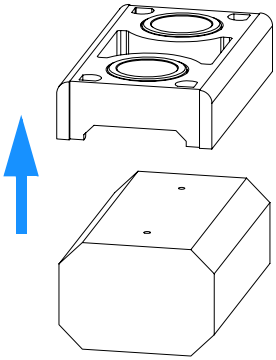
3 Unscrew the capillaries from the flow cell. DO NOT use the adapter at this time!



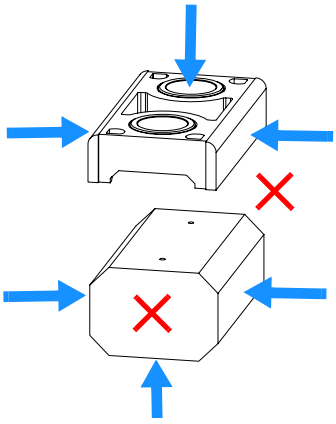
4 Using for example a toothpick, press on the plastic part and slide the quartz body out of the cell housing.



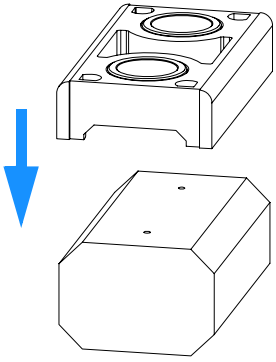
5 The quartz body and the cell seal assembly can be separated for cleaning purpose.



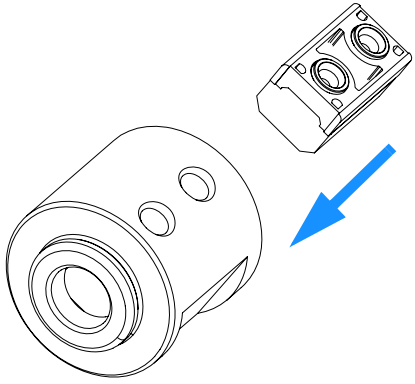
6 This figure shows the correct holding of the quartz body and the cell seal assembly.



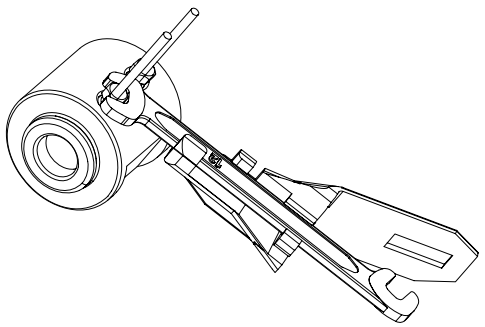
7 Replace the cell seal assembly onto the quartz body. Always use a new seal assembly to exclude damage during disassembling.



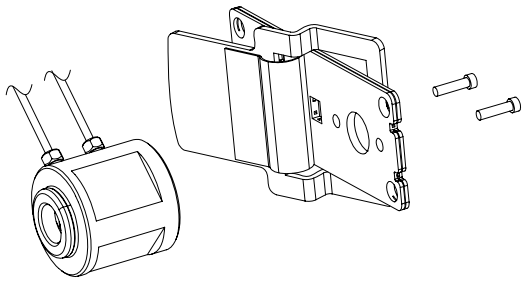
8 Slide the quartz body completely into the cell body to the front stop (use for example a toothpick).



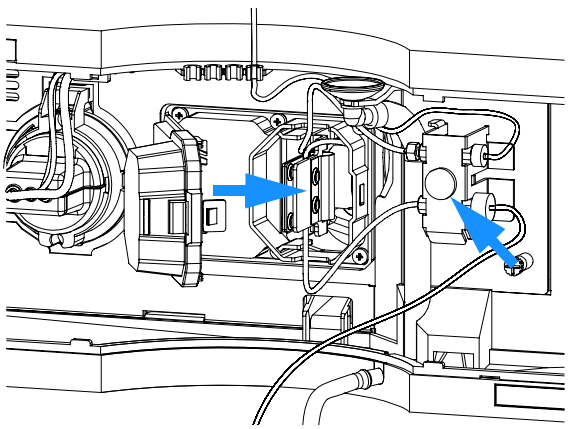
9 Insert the flow cell capillaries and tighten them fingertight. Use the wrench and torque adapter as described on page 235 and tighten the fittings alternately.



10 Reassemble the flow cell body to the holder.



11 Re-install the flow cell and connect the capillaries to the union holder.



Next Steps:

12 Perform a leak test with the flow cell outside of the detector.

13 If no leak is observed, install the flow cell and you are ready to work.

14 Make sure that the flow cell assembly is inserted correctly and fits perfectly in the optical unit (especially when PEEK capillaries are used).

NOTE The cell body can be fitted in two positions to allow the capillaries routed upwards or downwards (depending on where the column is located). Route the capillaries directly column (inlet) and waste assembly (outlet).

NOTE

With the instrument accessory kit comes a 4-mm wrench and with the Sealing Kit a special adapter. Both together work as a torque wrench with pre-defined torque (maximum allowed torque for the cell fittings is 0.7 Nm). It can be used to tight the capillary fittings at the flow cell body. The wrench has to be plugged into the adapter as shown in Figure 90.

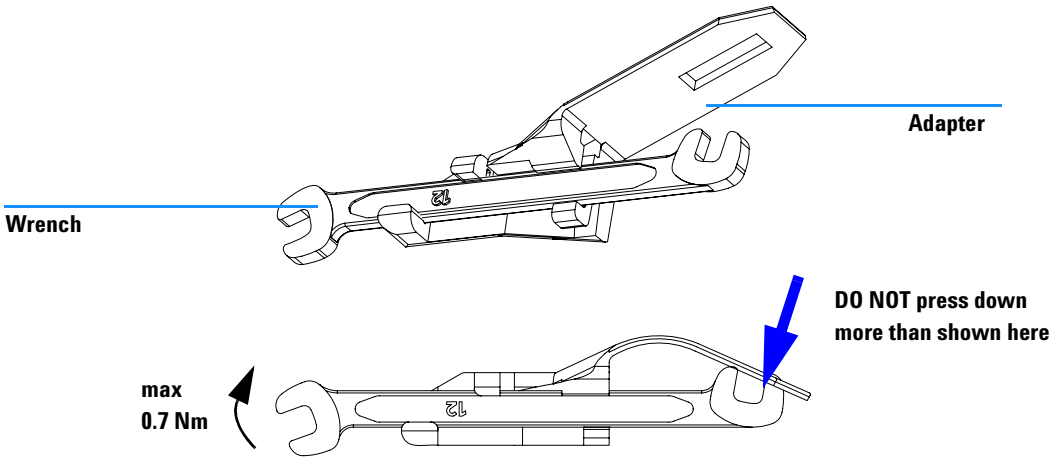


Figure 90 Wrench plus Torque Adapter

Cleaning or Exchanging the Holmium Oxide Filter

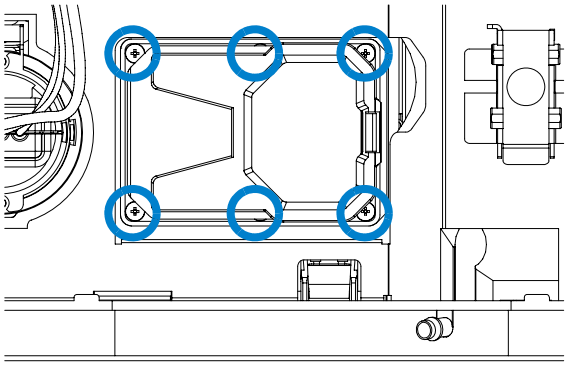
When required	If holmium oxide filter is contaminated
Tools required	Screwdriver POZI 1 PT3 Screwdriver flat blade Two 1/4 inch wrenches for capillary connections A pair of tweezers
Parts required	Holmium oxide filter 79880-22711
Preparations	Turn the lamp(s) off. Remove the front cover. Remove the flow cell, see "Exchanging a Flow Cell" on page 211.

NOTE

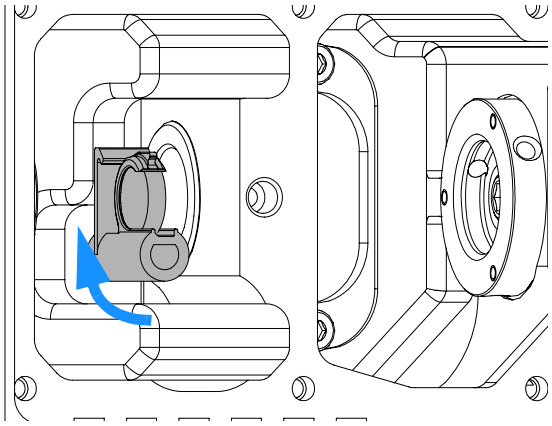
See also "Declaration of Conformity for HOX2 Filter" on page 391.

The glass tends to build a film on its surface even under normal environmental conditions. This is a phenomenon, which can be found also on the surface of several other glasses and has something to do with the composition of the glass. There is no indication, that the film has an influence on the measurement. Even in the case of a thick film, which scatters the light remarkably, no shift of the peak positions is to be expected. A slight change in the absorbance might be possible. Other components within the light path (lenses, windows, ...) are also changing their behavior over the time.

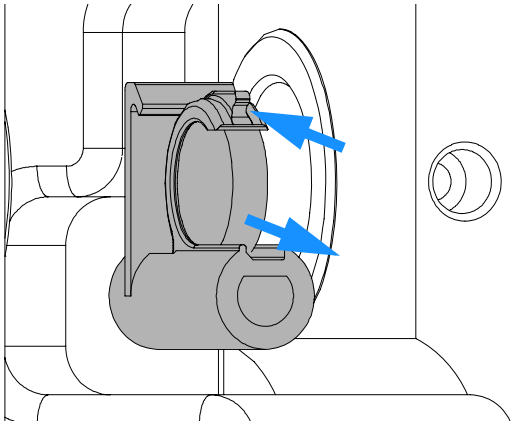
1 Unscrew the six screws and remove the flow cell cover.



2 If not already in this position, move the filter up.



3 While releasing the holder with a screw driver (at the top), carefully remove the holmium oxide filter.

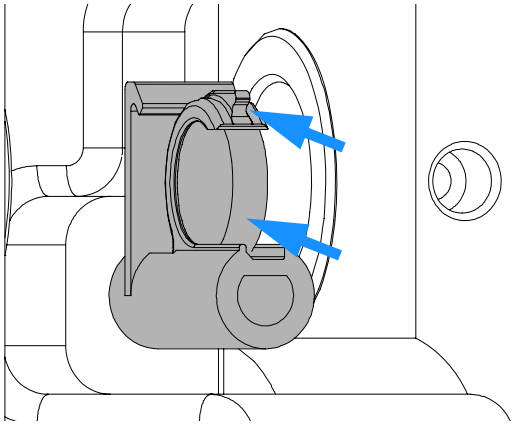


Note:

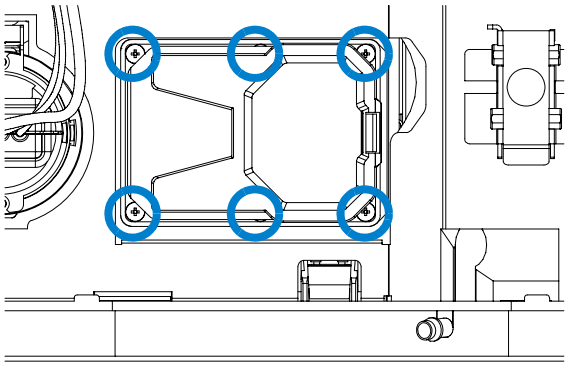
Do not scratch the holmium oxide filter.

The holmium oxide filter can be cleaned with alcohol and a lint-free cloth.

4 While releasing the holder with a screw driver, carefully insert the holmium oxide filter.



5 Replace the flow cell cover and fix the six screws.



Next steps:

6 Perform a holmium oxide test, see "Holmium Oxide Test" on page 247 to check the proper function of the holmium oxide filter.

7 Insert the flow cell, see "Exchanging a Flow Cell" on page 211.

8 Replace the front cover.

9 Turn on the flow.

Correcting Leaks

When required	If a leakage has occurred in the flow cell area or at the heat exchanger or at the capillary connections
Tools required	Tissue Two 1/4 inch wrenches for capillary connections
Parts required	None
Preparations	Remove the front cover.

1 Use tissue to dry the leak sensor area and the leak pan.

2 Observe the capillary connections and the flow cell area for leaks and correct, if required.

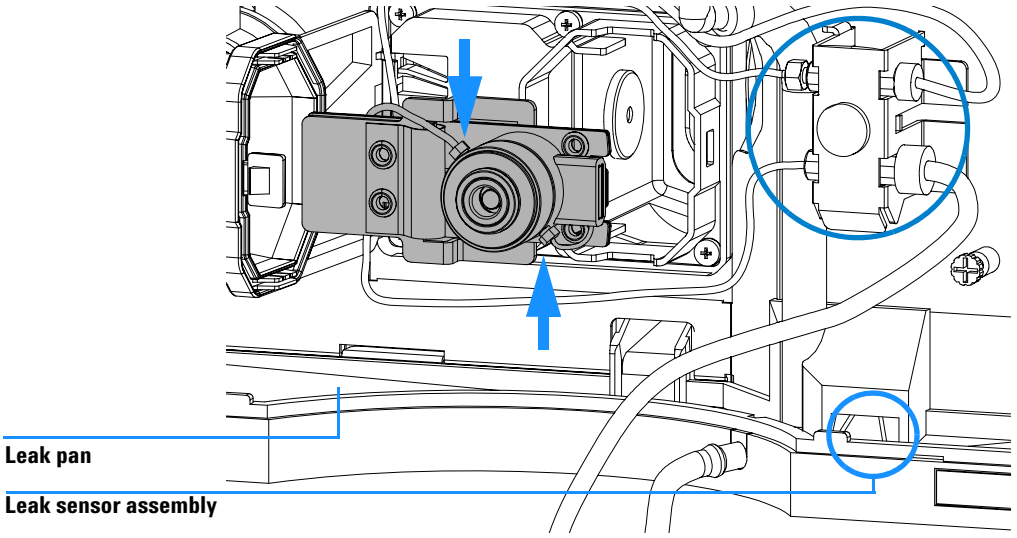


Figure 91 Observing for Leaks

3 Replace the front cover.

Replacing Leak Handling System Parts

When required	If the parts are corroded or broken
Tools required	None
Parts required	Leak funnel 5061-3388 Leak funnel holder 5041-8389 Leak tubing (120 mm) 0890-1711
Preparations	Remove the front cover.

1 Pull the leak funnel out of the leak funnel holder.

2 Pull out the leak funnel with the tubing.

3 Insert the leak funnel with the tubing in its position.

4 Insert the leak funnel into the leak funnel holder.

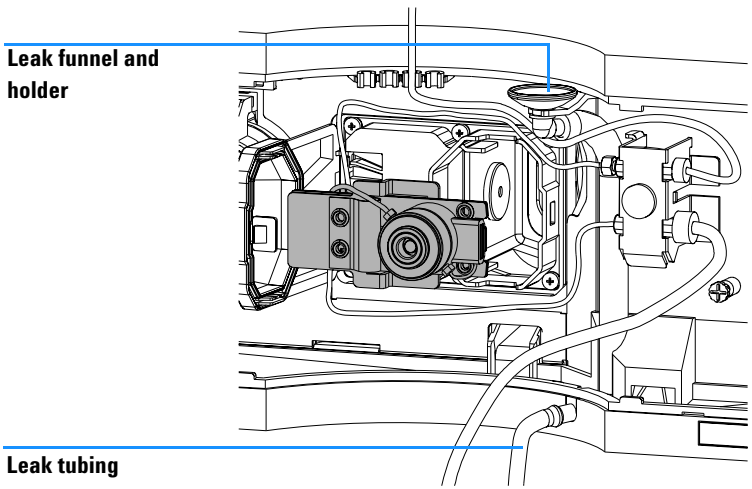


Figure 92 Replacing Leak Handling System Parts

5 Replace the front cover.

Replacing the CompactFlash Card (G1315C/G1365C only)

When required	If defective
Tools required	None
Parts required	CompactFlash Card Kit 01100-68700
Preparations	Turn the detector OFF and have access to the rear of the detector.

NOTE The G1315C DAD SL and G1365C MWD SL is equipped with a CompactFlash card. This CompactFlash card is required for the operation of the detector (data buffering). DO NOT use other types of CompactFlash cards. Only CompactFlash cards supplied with the detector or as replacement with above part number are tested with the detector.

1 Remove the CompactFlash card by pulling it out of its slot in the rear of the detector.

2 Install the new CompactFlash card into the slot.

3 Turn the detector ON.

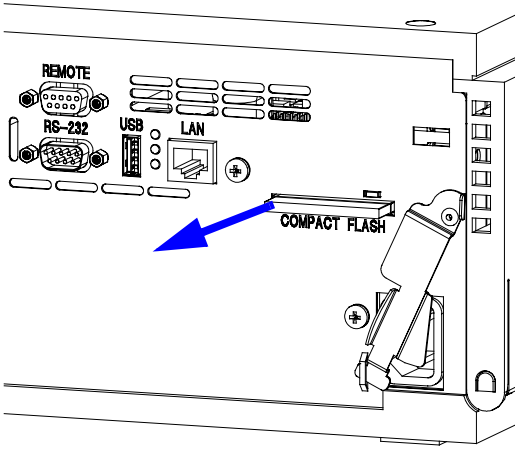


Figure 93 Replacing SanDisk CompactFlash card

Replacing the Detector's Firmware

When required	If new version solves problems of currently installed version or after exchange of the detector main board (DADM or MWDM) the version on board is older than previous installed one.
Tools required	LAN/RS-232 Firmware Update Tool, or Instant Pilot G4208A or Control Module G1323B
Parts required	Firmware, tools and documentation from Agilent web site
Preparations	Read update documentation provided with the Firmware Update Tool.

The installation of **older** firmware might be necessary:

- to keep all systems on the same (validated) revision, or
- if third part control software requires a special version.

To upgrade/downgrade the detector's firmware the following steps have to be performed:

1 Download the module's firmware, the LAN/RS-232 FW Update Tool Version 2.4 or above and the documentation from the Agilent web

http://www.chem.agilent.com/scripts/cag_firmware.asp.

2 Load the firmware into the detector as described in the documentation.

NOTE

The initial firmware revision of the G1315C DAD and the G1365C MWD is B.01.01 (main and resident). No further downgrade is possible.

The initial firmware revision of the G1315D DAD and the G1365D MWD is B.01.04 (main and resident). No further downgrade is possible.

NOTE

When using the G1315C/D and G1365C/D in a system, all other modules must be upgraded to firmware revision 6.x or above (main and resident). Otherwise the communication will not work.

Tests & Calibrations

The following tests are required after maintenance of lamps and flow cells:

- “Intensity Test” on page 244.
- “Wavelength Verification and Recalibration” on page 246.
- “Holmium Oxide Test” on page 247.
- “Cell Test” on page 249.

Intensity Test

NOTE The test is for the standard flow cells (10 mm and 6 mm pathlength) only. The nano-flow cells (80 nl and 500 nl) cannot be run with this test due to its low volume.

The intensity test measures the intensity of the deuterium and tungsten lamps over the full wavelength range (190 – 950 nm). Four spectral ranges are used to evaluate the intensity spectrum. The test is used to determine the performance of the lamps and optics (see also "Cell Test" on page 249). When the test is started, the 1-nm slit is moved into the light path automatically, and the gain is set to zero. To eliminate effects due to absorbing solvents, the test should be done with water in the flow cell. The shape of the intensity spectrum is primarily dependent on the lamp, grating, and diode array characteristics. Therefore, intensity spectra will differ slightly between instruments. Figure 94 on page 245 shows a typical intensity test spectrum.

Intensity Test Evaluation

The Agilent ChemStation evaluates four spectral ranges automatically, and displays the limits for each range, the measured intensity counts, and *passed* or *failed* for each spectral range (see Figure 94 on page 245).

NOTE The evaluation report is only on the Agilent ChemStation available.

Test Failed

Probable Causes

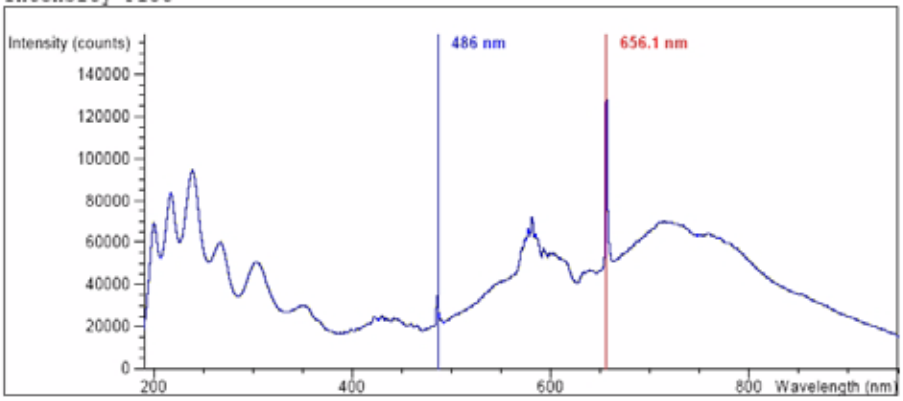
- Absorbing solvent or air bubble in flow cell.
- Dirty or contaminated flow cell.
- Dirty or contaminated optical components (achromat, windows).
- Old or non-Agilent lamp.

Suggested Actions

- ✔ Ensure the flow cell is filled with water, and free from air bubbles.
- ✔ Run the cell test (see “Cell Test” on page 249). If the test fails, exchange the flow cell windows.
- ✔ Clean optical components with alcohol and lint-free cloth.
- ✔ Exchange the lamp.

```
Instrument:       G1315C
Serial Number:    PP00000024
Operator:         Wolfgang
Date:             25.02.2005
Time:             14:53:05
File:             C:\CHEM32\2\DIAGNOSE\DAD_INT2.DGR
```

Intensity Plot



Intensity Test Results

	Specification	Measured	Result
Accumulated UV lamp on time		23.77 h	
Lowest intensity in range 190nm - 220nm:	> 2000 cts	18095 cts	Passed
Lowest intensity in range 221nm - 350nm:	> 5000 cts	26848 cts	Passed
Lowest intensity in range 351nm - 500nm:	> 2000 cts	16593 cts	Passed
Lowest intensity in range 501nm - 950nm:	> 4000 cts	15767 cts	Passed
Highest intensity in range 190nm - 350nm:	< 450000 cts	94508 cts	Passed
Highest intensity in range 700nm - 950nm:	< 300000 cts	69968 cts	Passed
Highest intensity for the D2 alpha line:	< 1200000 cts	159202 cts	Passed

Figure 94 Intensity Test Results (report)

Wavelength Verification and Recalibration

The detector uses the alpha (656.1 nm) and beta (486 nm) emission lines of the deuterium lamp for wavelength calibration. The sharp emission lines enable more accurate calibration than is possible with holmium oxide. When verificaation is started, the 1-nm slit is moved into the light path automatically, and the gain is set to zero. To eliminate effects due to absorbing solvents, the test should be done with bubble free degassed HPLC water in the flow cell.

If a deviation is found and displayed, it can be recalibrated by pressing Adjust. The deviations are tracked in the Calibration History (diagnosis buffer in the detector).

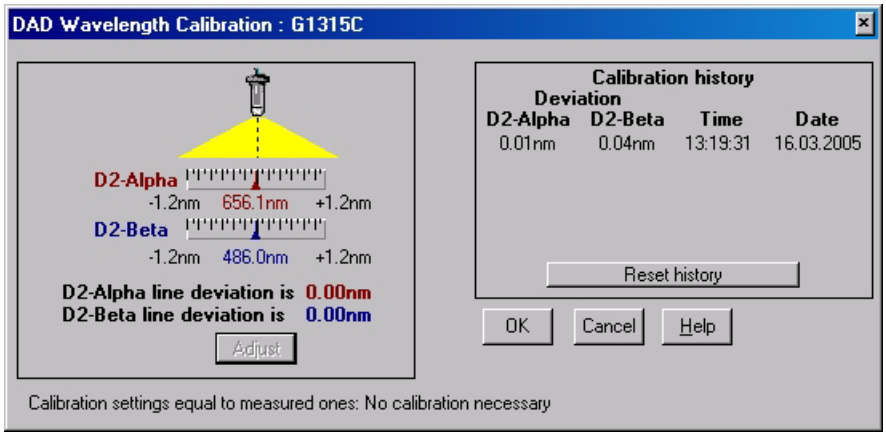


Figure 95 Wavelength Verification and Recalibration

Wavelength calibration should be done

- after maintenance of the flow cell,
- lamp exchange, or
- after a major repair, like processor board or optical unit exchange.

After calibration, the holmium oxide test (see "Holmium Oxide Test" on page 247) provides verification of wavelength accuracy at three additional wavelengths.

Holmium Oxide Test

The holmium oxide test uses three characteristic absorbance maxima of the built-in holmium oxide filter to verify wavelength accuracy (see also "Wavelength Verification and Recalibration" on page 246). When the test is started, the 1-nm slit is moved into the light path automatically. To eliminate effects due to absorbing solvents, the test should be done with water in the flow cell.

NOTE See also "Declaration of Conformity for HOX2 Filter" on page 391.

Holmium Oxide Test Evaluation

Limits:

361.0 nm	360.0 - 362.0 nm (± 1nm)
453.7 nm	452.7 - 454.7 nm (± 1nm)
536.7 nm	535.7 - 537.7 nm (± 1nm)

The test is evaluated by the instrument, and the measured maxima are displayed automatically. The test fails if one or more of the maxima lies outside of the limits (see Figure 96 on page 248).

NOTE The evaluation report is only on the Agilent ChemStation available.

Test Failed

Probable Causes

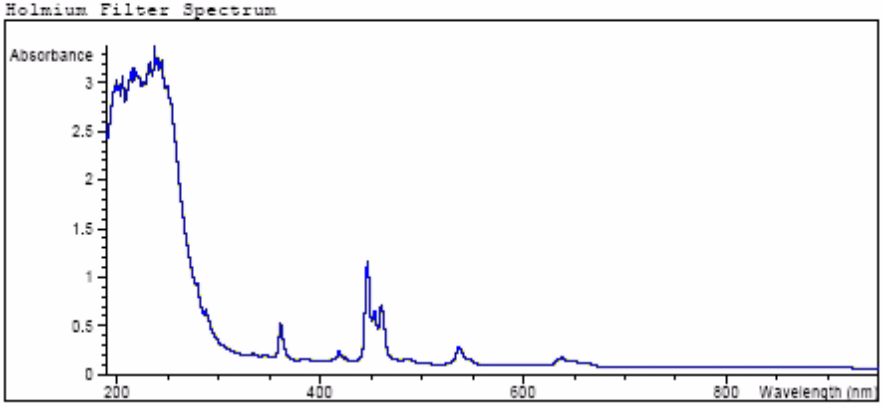
- Absorbing solvent or air bubble in flow cell.
- Incorrect calibration
- Dirty or contaminated flow cell.
- Dirty or contaminated optical components (achromat, windows).
- Old or non-Agilent lamp.

Suggested Actions

- ✔ Ensure the flow cell is filled with water.
- ✔ Recalibrate (see "Wavelength Verification and Recalibration" on page 246) and repeat the test.
- ✔ Run the cell test (see "Wavelength Verification and Recalibration" on page 246). If the test fails, exchange the flow cell windows.
- ✔ Clean optical components with alcohol and lint-free cloth.
- ✔ Exchange the UV lamp.

```
Instrument:          G1315C
Serial Number:       PP00000024
Operator:            Wolfgang
Date:                25.02.2005
Time:                14:30:08
File:                C:\CHEM32\2\DIAGNOSE\DAD_FILTER2.DGR
```

Holmium Filter Spectrum



Holmium Filter Test Results

	Specification	Measured	Result
Wavelength 1: 361.0 nm	360..362 nm	360.9 nm	Passed
Wavelength 2: 453.7 nm	452.7..454.7 nm	453.4 nm	Passed
Wavelength 3: 536.7 nm	535.7..537.7 nm	536.8 nm	Passed

Figure 96 Holmium Oxide Test Results (report)

Cell Test

The cell test measures the intensity of the deuterium and tungsten lamps over the full wavelength range (190 – 950 nm), once with the flow cell installed, and once with the flow cell removed. The resulting intensity ratio is a measure of the amount of light absorbed by the flow cell. The test can be used to check for dirty or contaminated flow cell windows. When the test is started, the 1-nm slit is moved into the light path automatically, and the gain is set to zero. To eliminate effects due to absorbing solvents, the test should be done with water in the flow cell.

NOTE This test should be performed inititially with a new detector/flow cell. The values should be kept for later reference/comparison.

Cell Test Evaluation

The Agilent ChemStation calculates the intensity ratio automatically. The intensity ratio (typically between 0.5 and 0.7 for **new standard flow cells**) is dependent on the degree of contamination of the flow cell windows, and on the type of flow cell used.

```
Instrument:       G1315C
Serial Number:    PP00000024
Operator:         Wolfgang
Date:             25.02.2005
Time:             14:54:22
File:             C:\CHEM32\2\DIAGNOSE\DAD_CELL2.DGR

                                                                    |    Result | Status
--------------------------------------------------------------------------------------------
Detector Cell Test                                                  |           |
Date: 25.02.2005;  Time: 14:54:22                                   |           |
Expected total time: approx. 45 s.                                  |           |
                                                                    |           |
Test Procedure:                                                     |           |
1. If cell not in place, install it                                 |           | done
2. Measuring intensity with cell                                   |     42053 | done
3. Remove cell                                                      |           | done
4. Measuring intensity without cell                                |     42034 | done
5. Calculating intensity ratio                                      |       1.0 | done
```

Figure 97 Cell Test Results (report) with no flow cell inserted

NOTE This test can be used for the standard flow cells only. The nano flow cells will give very low values due to their design.

Test Failed (low ratio value)

Probable Causes

- Absorbing solvent or air bubble in flow cell.
- Dirty or contaminated flow cell.

Suggested Actions

✔ Ensure the flow cell is filled with water, and free from air bubbles.

✔ Exchange the flow cell windows.

13
Repairs

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Assembling the Main Cover 302

This chapter describes the repair of the detector.

Cautions and Warnings

WARNING **The following procedures require opening the main cover of the detector. Always ensure the detector is disconnected from the line power when the main cover is removed. The security lever at the power input socket prevents that the detector cover is taken off when line power is still connected.**

WARNING **To disconnect the detector from line, unplug the power cord. The power supply still uses some power, even if the switch on the front panel is turned off.**

To prevent personal injury, be careful when getting in contact with sharp metal areas.

When working with solvents please observe appropriate safety procedures (for example, goggles, safety gloves and protective clothing) as described in the material handling and safety data sheet supplied by the solvent vendor, especially when toxic or hazardous solvents are used.

NOTE The electronics of the detector will not allow operation of the detector when the top cover and the top foam are removed. A safety light switch on the main board will inhibit the operation of the fan immediately. Voltages for the other electronic components will be turned off after 30 seconds. The status lamp will lit red and an error will be logged into the logbook of the user interface. Always operate the detector with the top covers in place.

CAUTION Electronic boards and components are sensitive to electrostatic discharge (ESD). In order to prevent damage always use an ESD protection when handling electronic boards and components, see "Using the ESD Strap" on page 205.

WARNING

Eye damage may result from directly viewing the light produced by the deuterium lamp used in this product. Always turn off the deuterium lamp before removing the deuterium lamp.

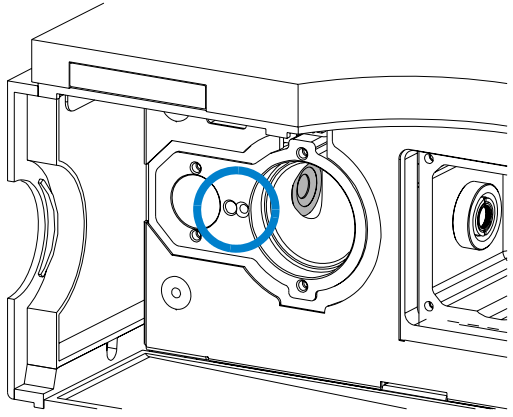
Cleaning or Replacing Coupling Lens Assembly

When required	The coupling lens assembly is located between the tungsten and the deuterium lamp. It may be replaced when light transmission is reduced and a lamp exchange or window cleaning does not improve the light throughput.
Tools required	Screwdriver POZI 1 PT3 hexagonal key 1.5 mm A pointed pair of pliers
Parts required	Coupling lens assembly G1103-68001
Preparations	Turn the lamp(s) off. Remove the front cover.

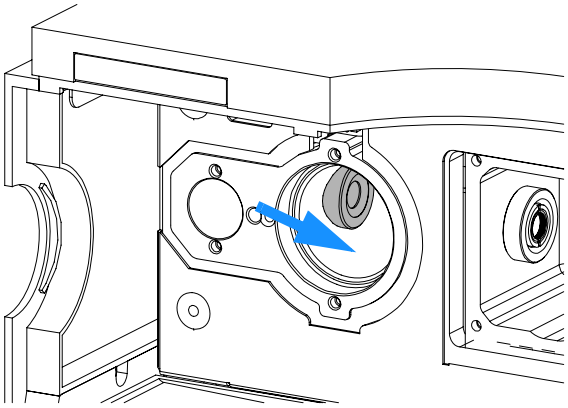
CAUTION If the detector has been in use, the lamp may be hot. If so, wait five minutes until lamp cools down.

1 Remove both lamps, see "Exchanging a Lamp" on page 209.

2 Use the 1.5-mm hex key to loosen the setscrew that secures the lens assembly.

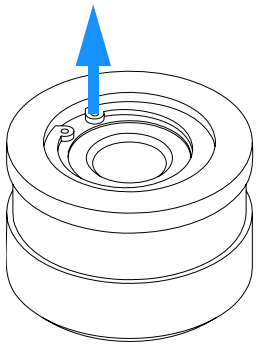


3 Carefully slide the lens assembly to the right into the deuterium lamp area by pushing it from the tungsten lamp side with the hex key.

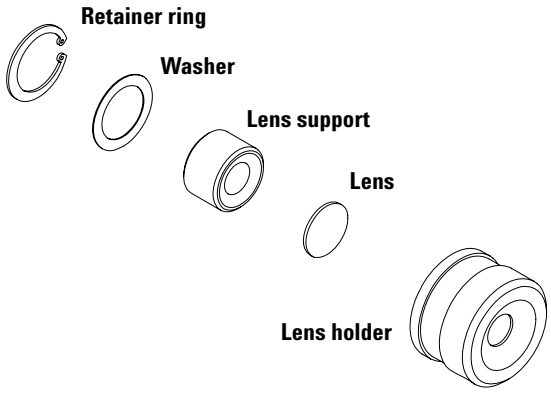


4 Remove the lens assembly completely.

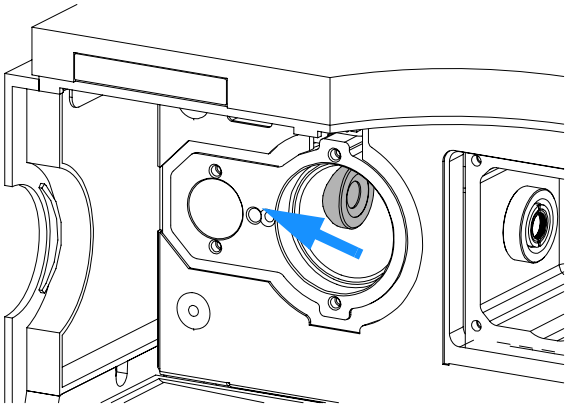
5 The assembly may be disassembled using a pair of pliers to remove the retainer ring.



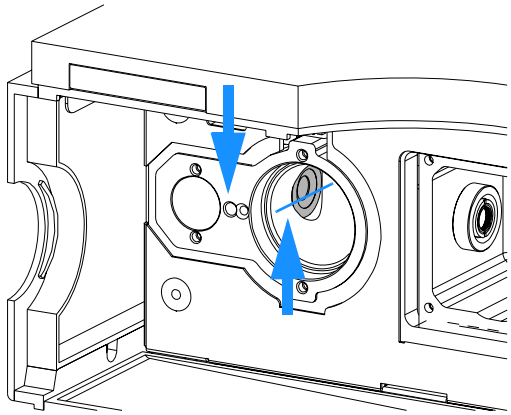
6 The lens may be cleaned or the complete assembly must be exchanged.



7 Insert the rebuilt or new lens assembly and slide it into its holder.



8 Align the lens assembly with the wall of the deuterium lamp area. Fix the setscrew that secures the lens assembly.



Next steps:

9 Replace both lamps.

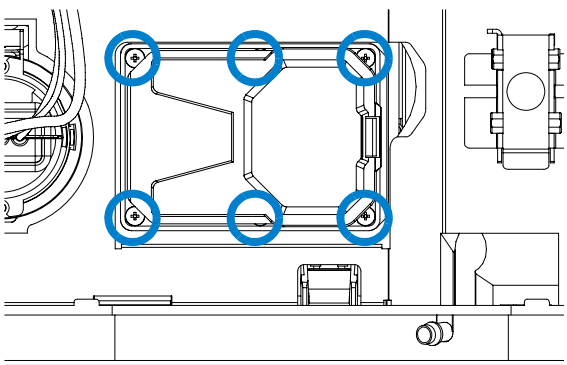
10 Perform an intensity test to check the proper function.

11 Replace the front cover.

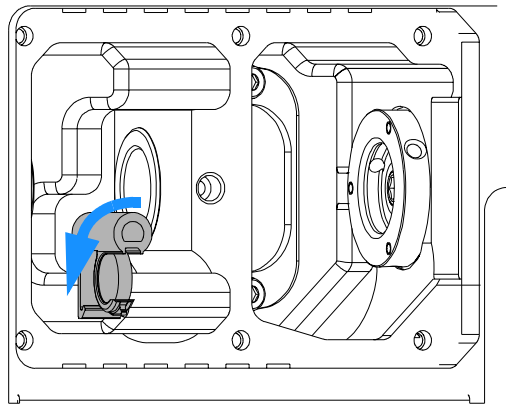
Cleaning or Replacing Cell Support Window

When required	This window is located between the holmium oxide filter and the flow cell. It may be replaced when the transmission of light is reduced and a lamp exchange or a window cleaning does not improve the light throughput.
Tools required	Screwdriver POZI 1 PT3 hexagonal key 1.5 mm Pointed pair of pliers
Parts required	Cell support window 79880-28111 Cell support window assembly G1315-65202 For other parts, see "Cell Support Assembly" on page 332
Preparations	Turn the lamp(s) off. Remove the front cover. Remove the flow cell, see "Exchanging a Flow Cell" on page 211.

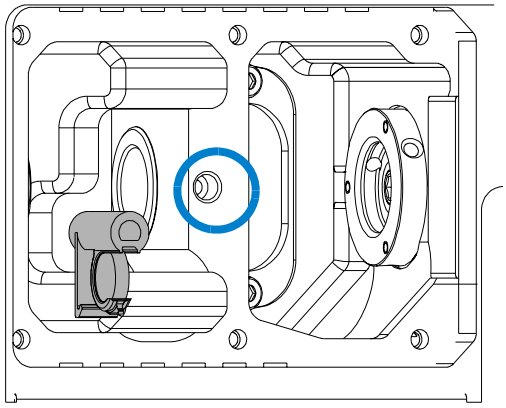
1 Unscrew the six screws and remove the flow cell cover.



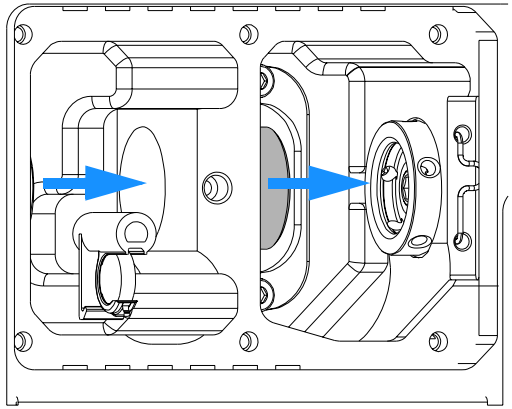
2 If not already in this position, move the holmium oxide filter down.



3 Use the 1.5-mm hex key to loosen the setscrew that secures the cell support assembly.

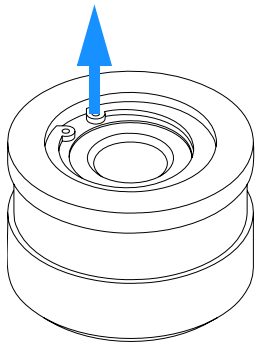


4 Carefully slide the assembly to the right into the flow cell compartment by pushing it from the holmium oxide filter side.

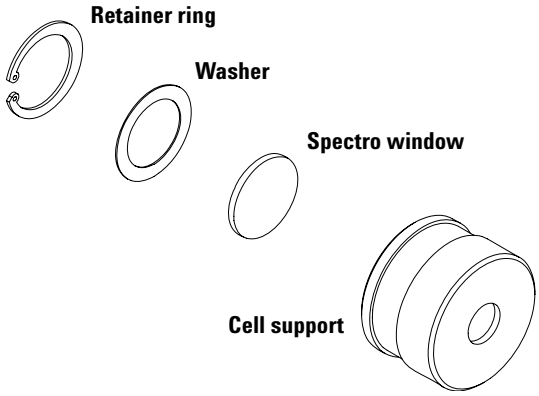


5 Remove the cell support assembly completely.

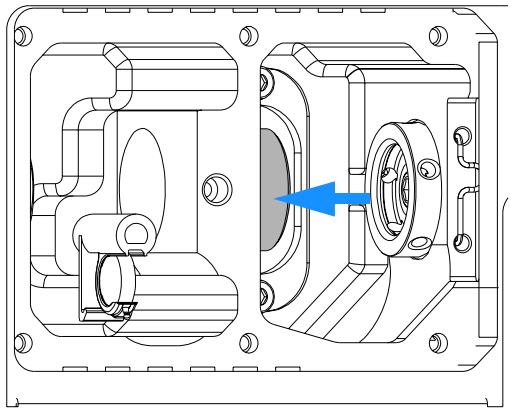
6 The assembly may be disassembled using a pair of pliers to remove the retainer ring.



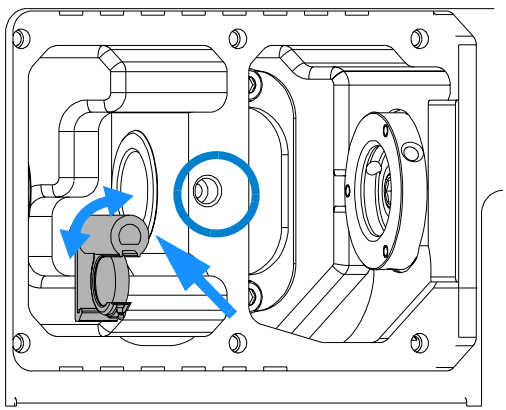
7 The window may be cleaned or the complete assembly must be exchanged.



8 Insert the rebuilt or new assembly and slide it in until it is stopped by the filter lever.



9 Leave slight clearance for movement of the filter lever between both, the lens assembly and the filter lever, and fix the setscrew.



Next steps:

10 Perform a filter test to check the proper function.

11 Replace the flow cell cover, see "Correcting Leaks" on page 239.

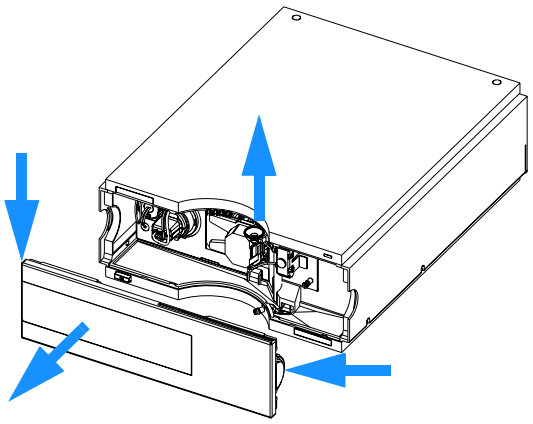
12 Replace both lamps.

13 Replace the front cover.

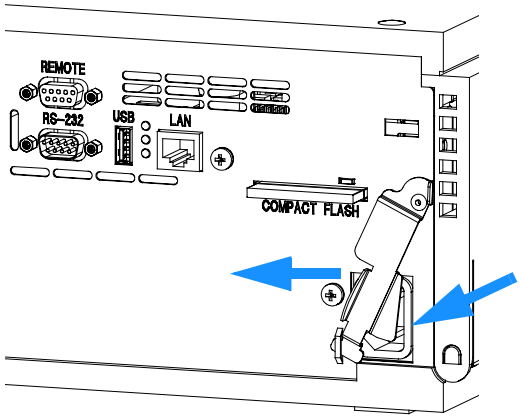
Removing the Top Cover and Foam

When required	For all repairs inside the detector
Tools required	Screwdriver POZI 1 PT3 Screwdriver
Parts required	Depends on the work inside and the following procedures
Preparations	• Turn off the detector. • Disconnect the power cable. • Disconnect capillaries. • Remove detector from stack and place it on the working bench.

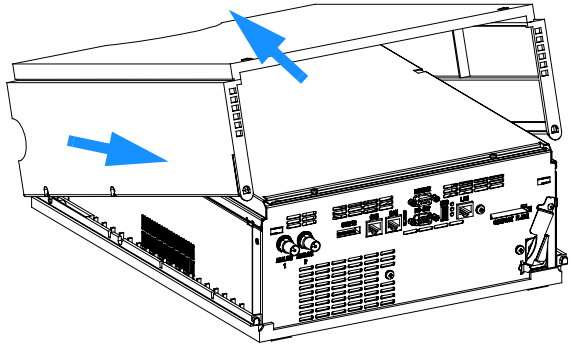
1 Press the release buttons and remove the front cover. Unclip the waste funnel assembly.



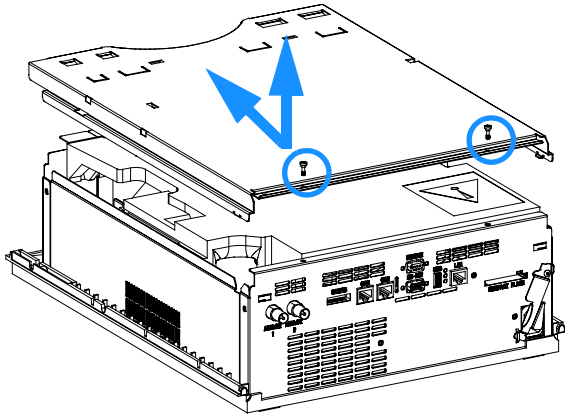
2 Move the power lock across the power inlet and lift the clips of the cover.



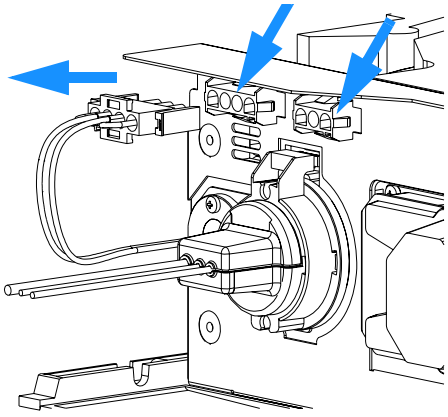
3 Lift the cover up and slide it towards the rear.



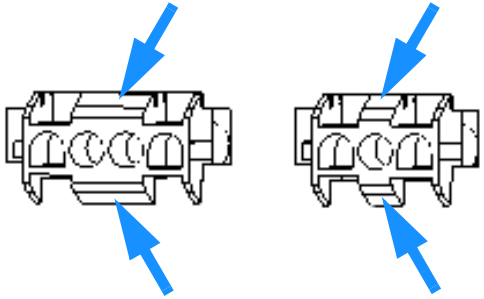
4 Unscrew the screws at the rear of the top plate, slide the plate towards the front and remove it.



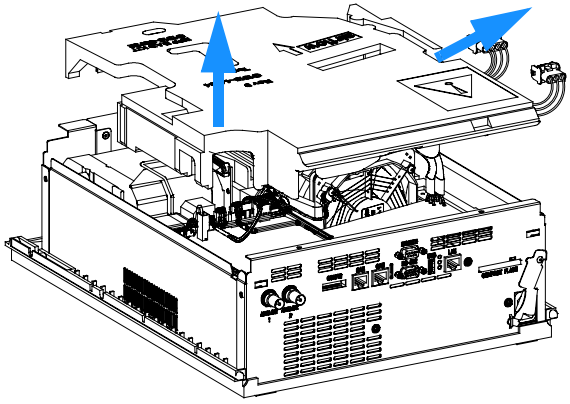
5 Disconnect the lamps from their connectors.



6 Remove the two lamp connectors towards the back by depressing their connector tabs with a screwdriver.



7 While removing the top foam section completely, route the lamp cables through the hole in the foam.



Note:

Do not connect a power plug to the detector module after removing the top covers and foams.

A safety light switch on the main board will turn off the lamps immediately to avoid the operation with removed covers. An error (Cover Open) will be generated (status lamp will light red) and the logbook will show an error message.

Exchanging the Detector Main Board

When required	If detector main board is defective or for repair on other assemblies
Tools required	Screwdriver POZI 1 PT3 Hexagonal wrenches 5 mm and 15 mm
Parts required	Detector main board (DADM/MWM) depends on product G1315-66560 for G1315C DAD-SL G1315-69560 (exchange assembly) for G1315C DAD-SL G1365-66560 for G1365C MWD-SL G1365-69560 (exchange assembly) for G1365C MWD-SL G1315-66565 for G1315D DAD G1315-69565 (exchange assembly) for G1315D DAD G1365-66565 for G1365D MWD G1365-69565 (exchange assembly) for G1365D MWD
Preparations	• Turn off the detector. • Disconnect the power cable. • Disconnect capillaries. • Remove detector from stack and place it on the working bench. • Remove the front cover, top cover and top foam section, see "Removing the Top Cover and Foam" on page 260.

CAUTION

Electronic boards and components are sensitive to electrostatic discharge (ESD). In order to prevent damage always use an ESD protection (for example, the ESD wrist strap from the accessory kit) when handling electronic boards and components, see "Using the ESD Strap" on page 205.

1 Use a 5-mm wrench to unscrew the REMOTE and the RS-232 nuts

2 Use a 15-mm wrench to unscrew the nuts of the ANALOG connectors.

3 Unscrew the screw left of the Compact Flash Card slot.

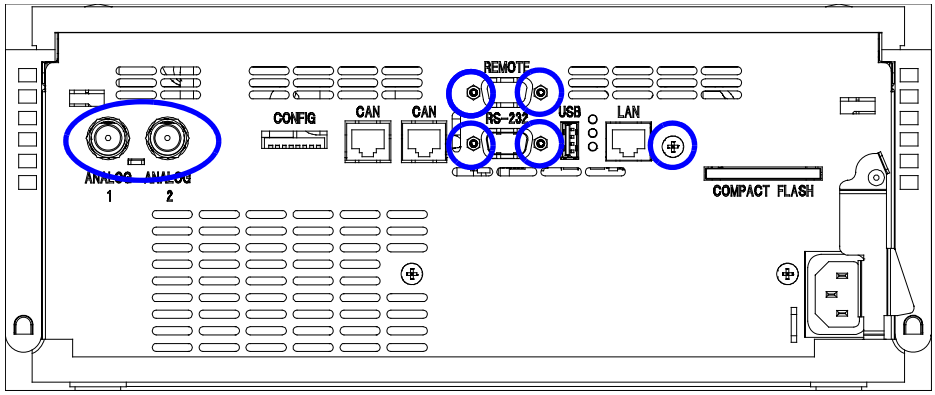


Figure 98 Unscrew nuts and screws

4 Disconnect all connectors from the detector main board.

NOTE When removing connectors, counter-hold with one hand on connector J13.

5 Remove the detector main board. Place the board on the ESD kit.

6 On the new board check the switch setting of address switch S1, see "Setting the 8-bit Configuration Switch" on page 372.

NOTE An incorrect switch setting (for example, TEST/BOOT) may cause the module to turn in a basic mode (yellow or red flashing status light). In such a case turn off the module, reset the address switches, and turn on the module again.

NOTE The PCMCIA interface has been removed on all detectors with the introduction of the G1315D DAD and G1365D MWD. Main boards for the G1315C DAD-SL and G1365C MWD-SL may still have the interface. If used for replacements in a detector without the opening in the cabinet, refer to "Removing the PCMCIA Interface" on page 272.

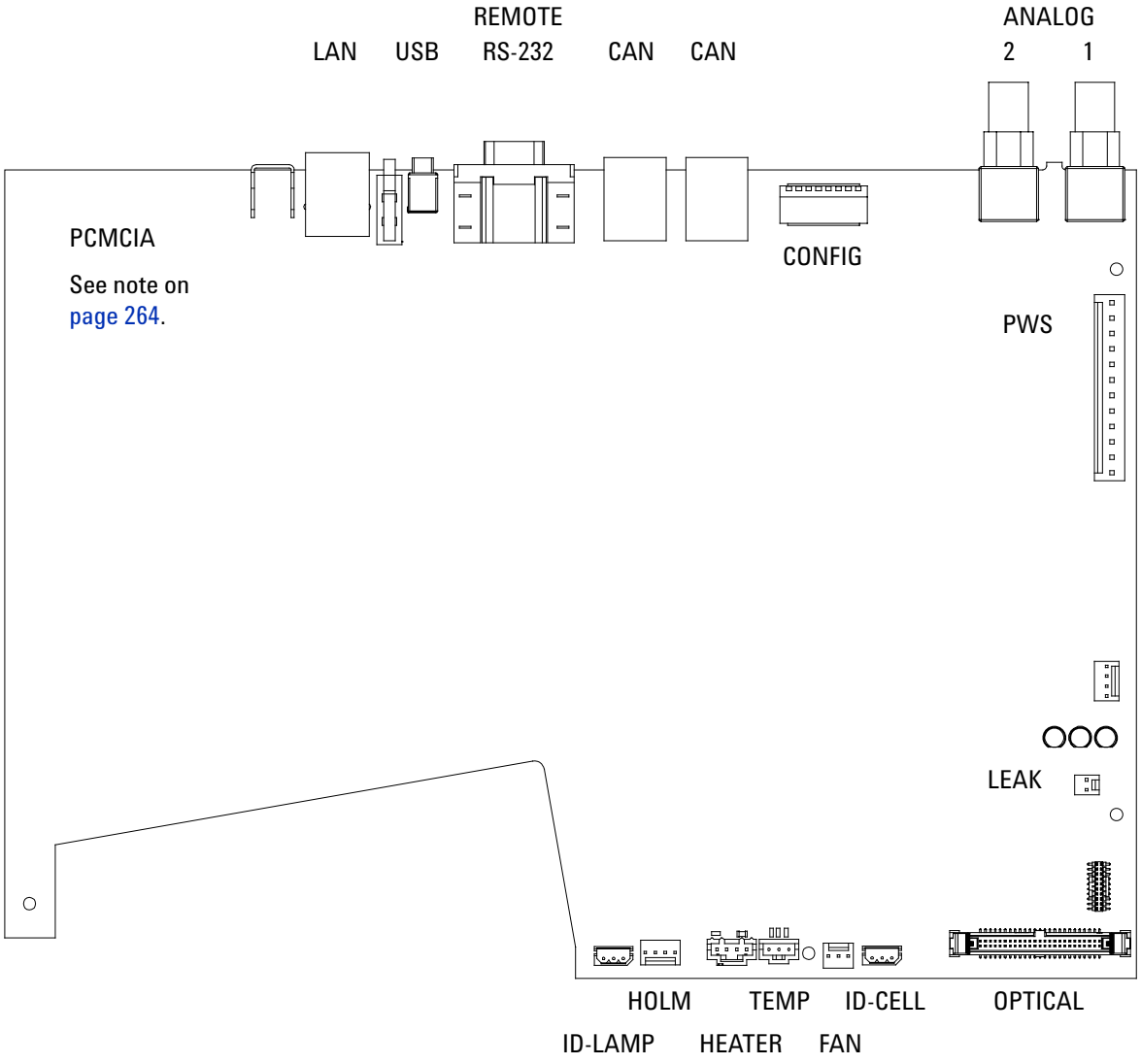


Figure 99 Location of Connectors on Detector Main Board

Table 26 Connections on the main board (see Figure 99 on page 265)

Connector	Description	Connector	Description
PCMCIA	removed in November 2006	OPTICAL	connects to optical unit
LAN	connects to LAN interface	ID-CELL	connects to ID-reader of flow cell
USB	for future use	FAN	connects to the fan
REMOTE	remote control	TEMP	connects to temperature sensor
CAN	inter-module communication	HEATER	connects to heater
ANALOG	signal to plotter or data system	HOLM	connects to stepper motor
PWS	connects to power supply	ID-LAMP	connects to ID-reader of UV-lamp
LEAK	connects to leak sensor		

7 Install the new detector main board and reconnect the connectors. Assure that the board is fitted correctly into the board recess in the rear panel.

8 Refit the nuts at the REMOTE, RS-232 and analog connectors

9 Fix the three screws at the rear panel.

10 Reinstall the top foam section, top cover and front cover, see "Replacing the Foam and the Top Cover" on page 299.

11 Replace detector into the stack and reconnect the cables and capillaries.

NOTE If a new detector main board is installed, update the serial number information of the detector in the user interface, see procedure below.

12 Check the firmware revision of the module. If the firmware revision is older than the current firmware revision of the module, update the firmware using the standard firmware update procedure, see "Replacing the Detector's Firmware" on page 242.

NOTE The initial firmware revision of the G1315C DAD and the G1365C MWD is B.01.01 (main and resident). No further downgrade is possible.

The initial firmware revision of the G1315D DAD and the G1365D MWD is B.01.04 (main and resident). No further downgrade is possible.

Changing the Product Number and Serial Number

When required	If main board has been replaced.
Tools required	User interface
Parts required	none
Preparations	• Turn the detector on. • Start the user interface.

When the main board has to be replaced, the new board does not have a serial number. For some modules (e.g. pumps or autosamplers), the type has to be changed (multiple usage boards). Use the information from the serial number plate of your module.

The changes become active after the reboot of the module.

Using the Agilent ChemStation

Module serial numbers are entered by typing specific commands on the command line at the bottom of the main user interface screen.

1 To enter a module serial number, type the following command into the command line:

```
print sendmodule$(ndad, "ser 'YYYYYYYYYY'")
```

```
print sendmodule$(nmwd, "ser 'YYYYYYYYYY'")
```

Where: YYYYYYYYYY is the 10-character serial number of the module in question.

NOTE The first two characters are letters, which should be capitalized.

The reply line will respond with **RA 0000 SER** followed by the module serial number you just entered.

To change the type of the module use the following command:

```
print sendmodule$(ndad, "TYPE 'XXXXX'")
print sendmodule$(nmwd, "TYPE 'XXXXX'")
```

Where: XXXXX is the 5-character product number of the module (e.g. G1315C).

NOTE To configure the detector as G1315C (DAD-SL) and G1315D (DAD) requires the correct main board version.

WARNING **If you enter the wrong type, your module will not be accessible anymore. In such a case see "Changing the Product Number and Serial Number" on page 267 or "Using the Control Module G1323B" on page 270 for recovering.**

2 Turn OFF the module, then ON again. Then, restart the Agilent ChemStation. If the serial number you have just entered is different than the original module serial number, you will be given the opportunity to edit the configure **1200 access** screen during the restart of the Agilent ChemStation.

3 After restart, the serial number/type you have just entered can be seen under the **Instrument** menu of the main user interface screen.

Using the Instant Pilot G2408A

1 Connect the Instant Pilot to the detector's CAN connector. Turn ON the detector.

2 On the Instant Pilot's Welcome screen, press **More**, then select **Maintenance**. Using the **up/down arrows**, select the detector where you have to change the product number or serial number.

3 Press **PN/SN**. This will display a screen where you can enter the product number and/or serial number.

4 Make your changes, using the information from the product label of your module.

NOTE To configure the detector as G1315C (DAD-SL) and G1315D (DAD) requires the correct main board version.

WARNING **If you enter the wrong type, your module might not be accessible anymore with the Agilent ChemStation and the Instant Pilot (unsupported module). In such a case follow the "Recover Instructions" on page 269.**

5 Press **OK** to highlight the complete command.

6 Press **Done** to transfer the information into the main board's memory. Press **Cancel** quit the process.

7 Turn the detector OFF then ON again. The Maintenance screen should display the correct serial number for this module.

8 If an Agilent ChemStation is also connected, restart the Agilent ChemStation now as well.

Recover Instructions

1 Turn off the detector.

2 Change the 8-bit Configuration Switch to Resident (see "Boot-Resident Settings" on page 374).

3 Turn the detector on.

4 Re-do steps 2 to 5 of "Changing the Product Number and Serial Number" on page 267 and correct the type information. Enter the product number without "-R"

5 Turn the detector off.

6 Change the 8-bit Configuration Switch back to default settings (see "Setting the 8-bit Configuration Switch" on page 372).

7 Turn the detector ON again. The Maintenance screen should display the correct type for this module.

Using the Control Module G1323B

1 Connect the control module to the detector. Turn ON the detector.

2 On the control module, press **System** (**F5**), then **Records** (**F4**). Using the **up/down arrows**, make sure that the detector is highlighted.

3 Press **FW Update** (**F5**), then **m.** This will display a box which says **Update Enter Serial#**.

4 Press **Enter**. This will display the box labeled **Serial#**.

5 Letters and numbers are created using the up and down arrows. Into the box labeled Serial#, enter the 10-character serial number for the detector. When the 10-character serial number is entered, press **Enter** to highlight the complete serial number. Then, press **Done** (**F6**).

6 Turn the detector OFF then ON again. The Records screen should display the correct serial number for this module.

7 If an Agilent ChemStation is also connected, restart the Agilent ChemStation now as well.

To change the product number go to the **System** screen.

1 Press **Tests (F3)** and select the detector being changed and press **Enter**.

2 While in the Tests screen, press **m.m** (m dot m).

3 From the box now displayed, select the **Command**, and press **Enter**.

4 Into the box labeled **Instr** (instruction), enter the command **TYPE XXXXX**.

Letters and numbers are created using the up and down arrows. XXXXX is the 5-character product number of the detector being changed. There must be a space between the word TYPE and the product number.

Examples: **TYPE G1315C** to configure as a DAD-SL.

TYPE G1365C to configure as a MWD-SL.

NOTE To configure the detector as G1315C (DAD-SL) and G1315D (DAD) requires the correct main board version.

WARNING **If you enter the wrong type, your module might not be accessible anymore with the Agilent ChemStation. In such a case re-enter the TYPE command correctly.**

5 Now, press the **Execute** key. Below the box, a reply line should then say:

Reply RA 0000 TYPE "XXXXX" (XXXXX is what you just entered)

6 Turn the detector off, then on again. Turn on should be normal. In the Records screen, the product# column should indicate the module you just entered. If an Agilent ChemStation is also connected, re-boot it now.

Removing the PCMCIA Interface

NOTE The PCMICIA slot has been removed from all detectors in November 2006 with the introduction of the G1315D DAD and G1365D MWD.

Follow the procedure below when installing a main board of the G1315C DAD-SL or G1365C MWD-SL with a PCMCIA interface into a detector that does not have the slit in the cabinet.

1 Place the main board on the ESD protection kit.

2 Locate the two screws that fix the PCMCIA interface on the board.

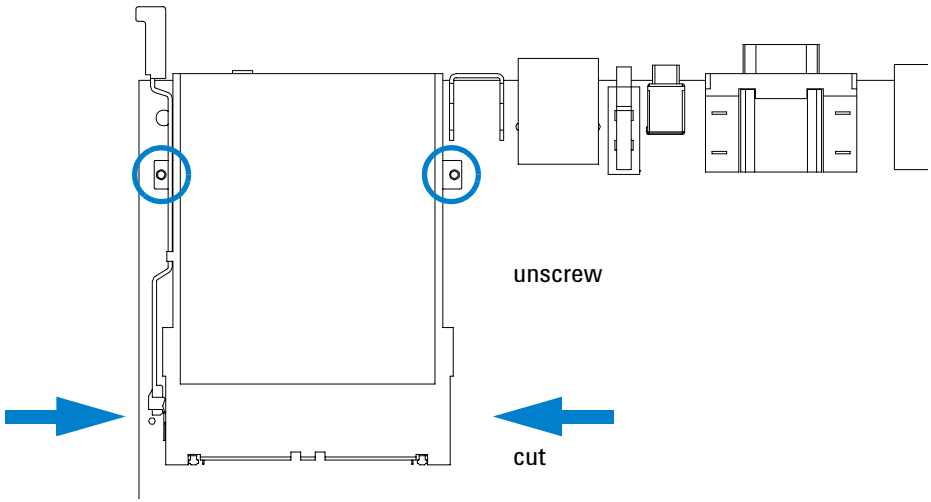


Figure 100 Removing the PCMCIA Interface

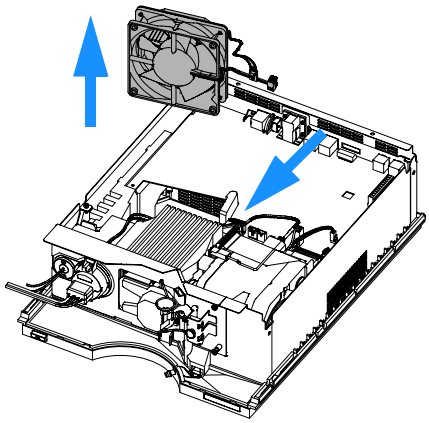
3 Unscrew the two screws (1.5 mm hexagonal key) from the opposite side of the board.

4 Carefully remove the metal part of the PCMCIA interface. Using a wire cutting pliers cut the thin metal part from the black rear.

Replacing Fan Parts

When required	If the fan is defective or noisy or the heater fails
Tools required	Screwdriver POZI 1 PT3, a pair of pliers
Parts required	Fan assembly 3160-1016, heater assembly G1315-60013
Preparations	• Turn off the lamp. • Switch off the detector, and disconnect the cables and capillaries. • Remove detector from stack and place it on the working bench. • Remove front cover, top cover and top foam section, see "Removing the Top Cover and Foam" on page 260.

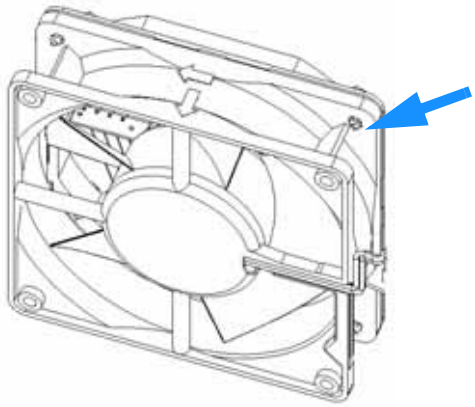
1 Disconnect the connectors from the main board; fan, temperature sensor and heater and pull the fan assembly out of its location.



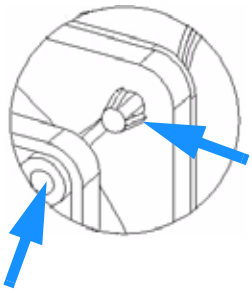
The heater is clipped into the fan assembly.

If the fan is defective, unclip the heater assembly from the fan as described in the next steps.

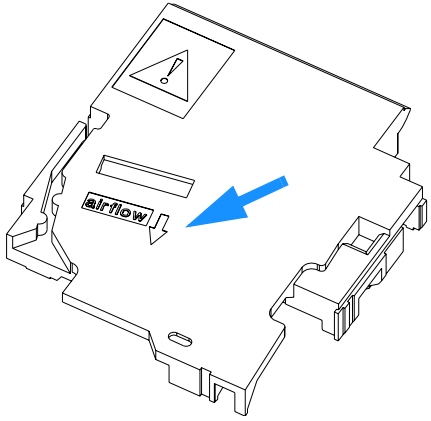
2 To unclip the heater from the fan, use a pair of pliers, squeeze the clips and push them through the hole. Repeat this with the three remaining clips.



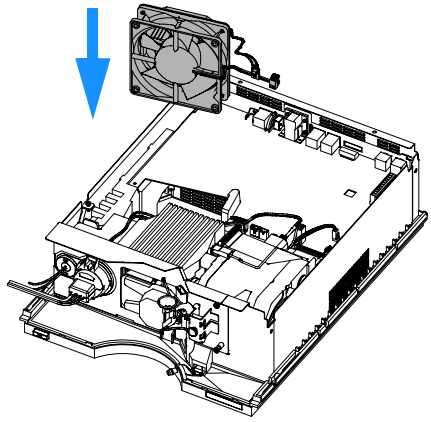
3 Position the heater assembly and clip the heater onto the fan. The cables should be oriented towards the left corner.



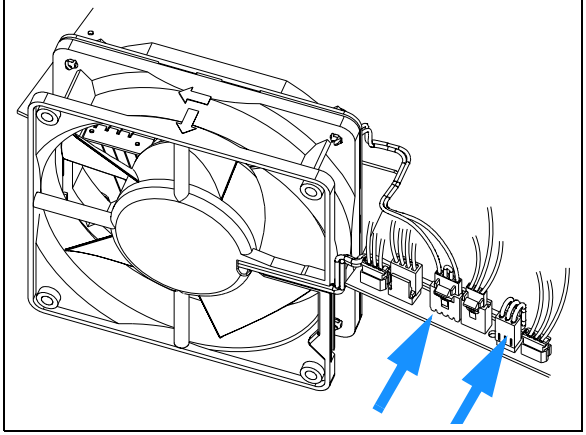
The fan must be installed in the correct orientation (see arrow on the top foam) to ensure optimum cooling and operation of the detector. The direction of air flow is from the rear towards the front.



4 Insert the fan assembly into its location.



5 Reconnect the fan and heater to the main board, see figure below for location.



Next Steps:

6 Reinstall the top foam section, top cover and front cover, see "Replacing the Foam and the Top Cover" on page 299.

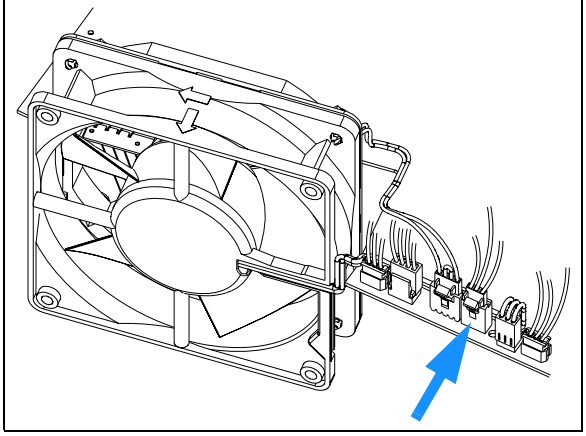
7 Replace the detector into the stack.

8 Reconnect cables, capillaries and turn on detector.

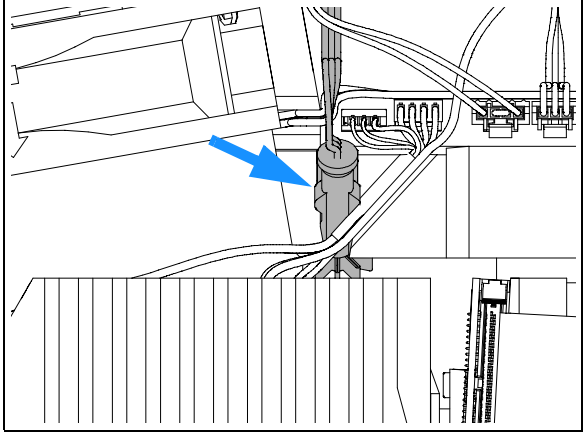
Replacing Temperature Sensor

When required	If the sensor is defective
Tools required	Screwdriver POZI 1 PT3, a pair of pliers
Parts required	Temperature sensor assembly G1315-60003
Preparations	• Turn off the lamp. • Switch off the detector, and disconnect the cables and capillaries. • Remove detector from stack and place it on the working bench. • Remove front cover, top cover and top foam section, see "Removing the Top Cover and Foam" on page 260.

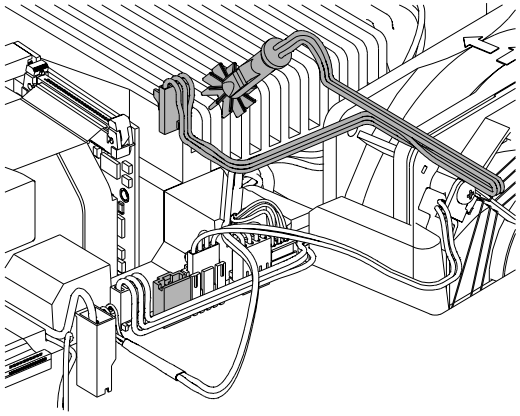
1 Disconnect the temperature sensor connector from the main board.



2 The temperature sensor is clipped into the foam behind the optical.



3 Insert the temperature sensor and reconnect it to the main board, see figure below for location.



Next Steps:

4 Reinstall the top foam section, top cover and front cover, see "Replacing the Foam and the Top Cover" on page 299.

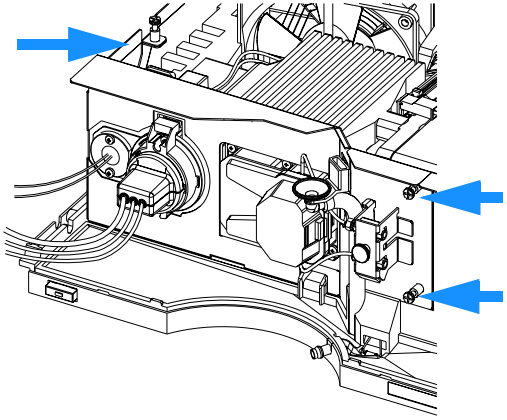
5 Replace the detector into the stack.

6 Reconnect cables, capillaries and turn on detector.

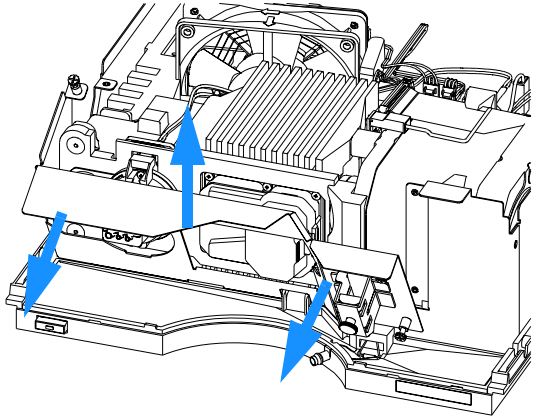
Replacing the Tag Reader (Lamp)

When required	If defective
Tools required	Screwdriver POZI 1 PT3 hexagonal key 2.5 mm
Parts required	Tag reader assembly (lamp) G1315-60006
Preparations	• Turn off the lamp. • Switch off the detector, and disconnect the power cable. • Remove detector from stack and place it on working bench. • Remove front cover, top cover and top foam section, see "Removing the Top Cover and Foam" on page 260.

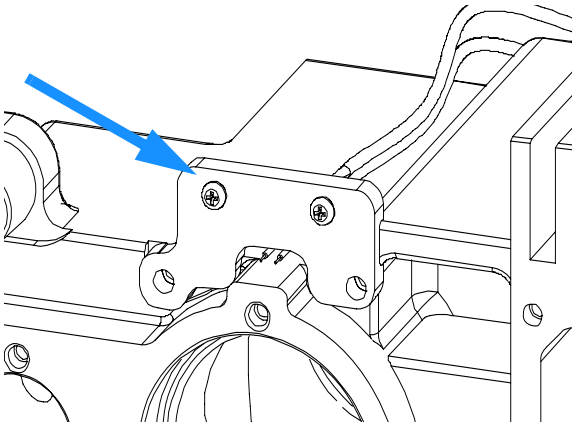
1 Loosen the screw on the left side of the z-plane and the two screws near the hydraulic connection.



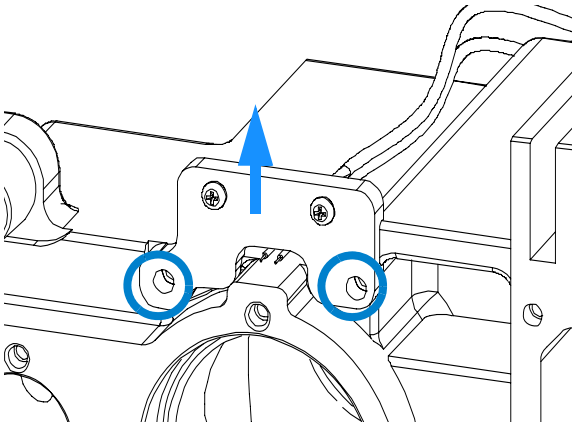
2 Slide the z-plane to the front and remove it from the module.



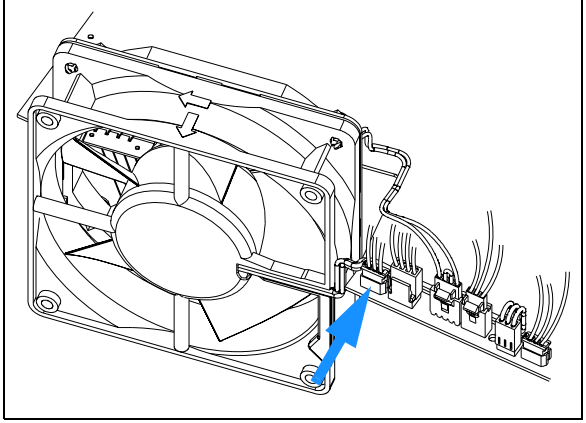
3 Carefully pull the isolation seal above the UV-lamp to the front to have access to the tag reader (the figure shows the lamps and the isolation seal removed).



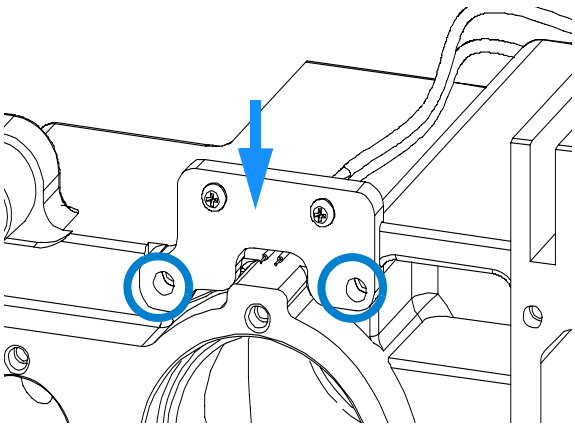
4 Unscrew the two screws using a 2.5 mm hex key and remove the tag reader assembly.



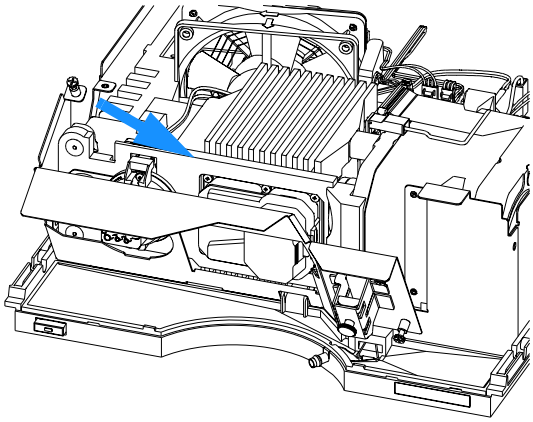
5 Disconnect the tag reader connector from the mainboard.



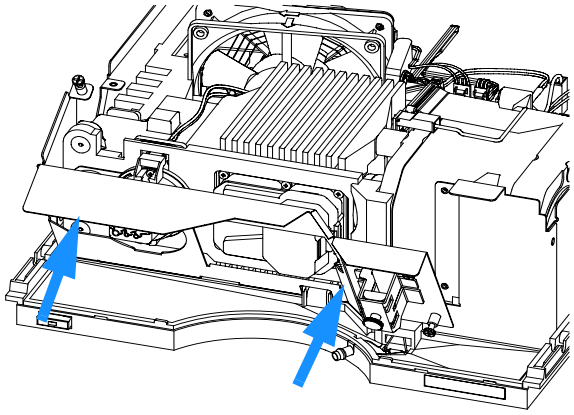
6 Replace the tag reader assembly and fix the two screws and reconnect the tag reader connector to the mainboard.



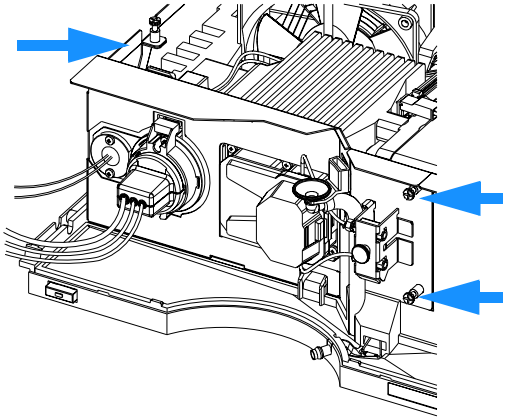
7 Ensure that the isolation seal fits correctly.



8 Install the z-plane.



9 Fix the screw on the left side of the z-plane and the two screws near the hydraulic connection.



Next steps:

10 Reinstall the front cover, top cover and top foam section, see "Replacing the Foam and the Top Cover" on page 299.

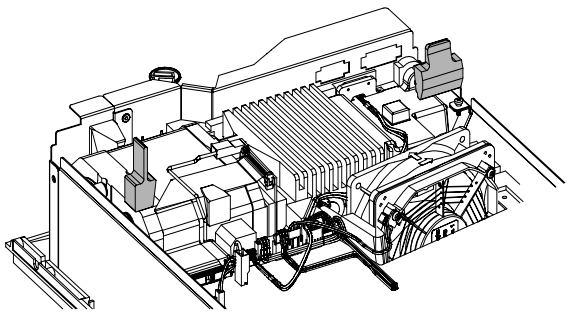
11 Replace the detector into the stack.

12 Reconnect the power cable and turn on detector.

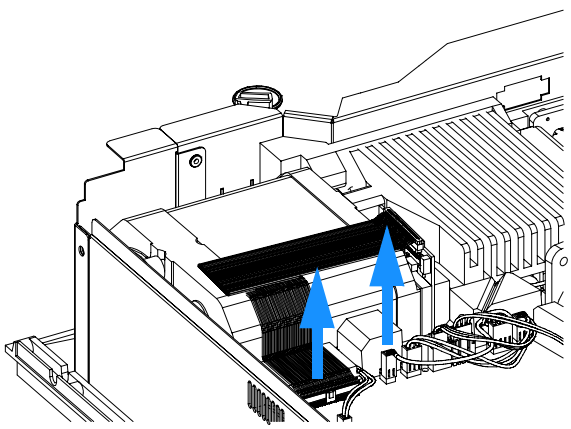
Removing the Optical Unit

When required	For all repairs inside the optical unit
Tools required	Screwdriver POZI 1 PT3
Parts required	Optical unit G1315-69002 (exchange assembly) or Individual parts depending on the following procedures
Preparations	• Turn off the lamp. • Switch off detector, and disconnect power cable. • Remove detector from stack and place it on the working bench. • Remove front cover, top cover and top foam section, see "Removing the Top Cover and Foam" on page 260.

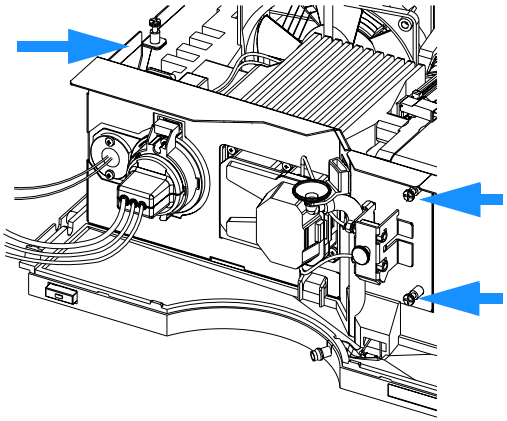
1 Remove the two rubber shock absorbers.



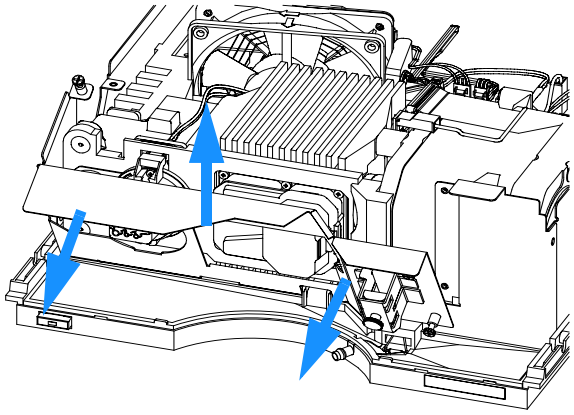
2 Disconnect the cable to the optical unit to the holmium oxide filter motor from the detector main board.



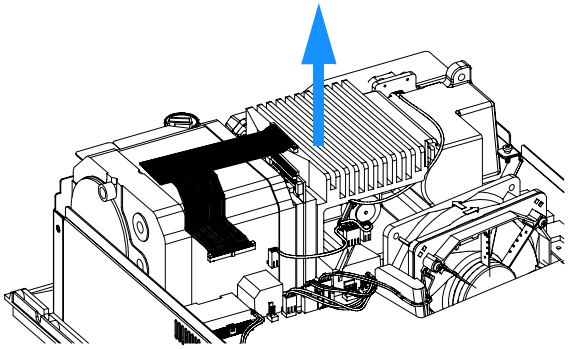
3 Loosen the screw on the left side of the z-plane and the two screws near the hydraulic connection.



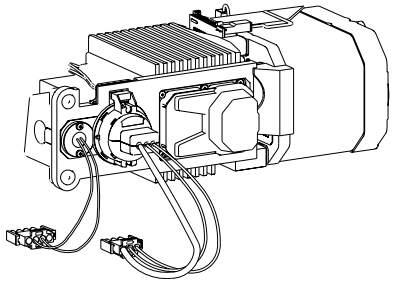
4 Slide the z-plane to the front and remove it from the module.



5 Remove the optical unit from the instrument holding the one hand at back of the heat sink.



6 Place the optical on a clean bench.

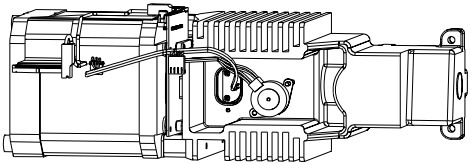


Exchanging the Source Lens (Achromat) Assembly

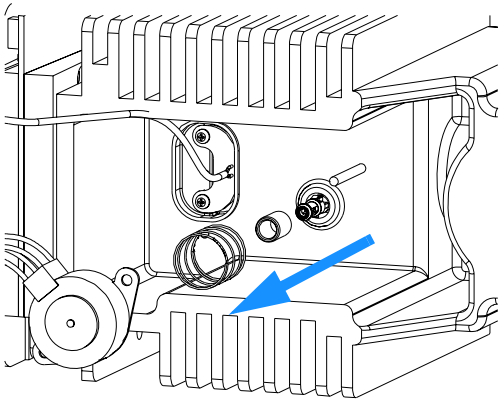
When required	The source lens (achromat) assembly might be cleaned or replaced when the transmission of light is reduced and a lamp exchange or new spectro windows do not improve the light throughput
Tools required	Screwdriver POZI 1 PT3 hexagonal key 1.5 mm A pointed pair of pliers
Parts required	Source lens (achromat) assembly G1315-65201(includes filter lever G1315-45001) Spectro window 79880-28111 Filter lever G1315-45001
Preparations	• Turn off the lamp. • Switch off detector and disconnect the power cable. • Remove detector from stack and place it on the working bench. • Remove the front cover, top cover and top foam section, see "Removing the Top Cover and Foam" on page 260. • Remove the optical unit, see "Removing the Optical Unit" on page 281. • Remove the UV-lamp.

NOTE If the filter motor was removed, the filter lever should not be reused. Always use a new filter lever to assure correct fit on the filter motor shaft.

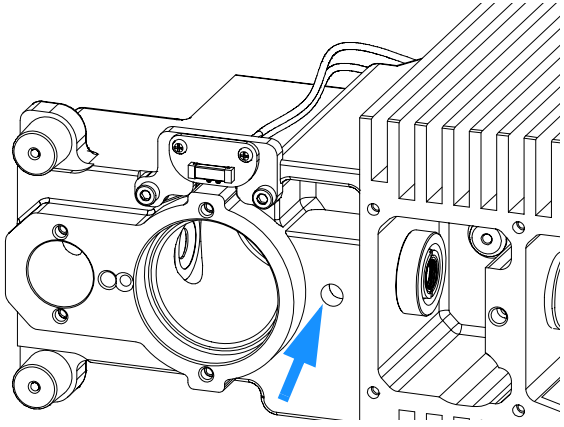
1 Place the optical unit on your bench.



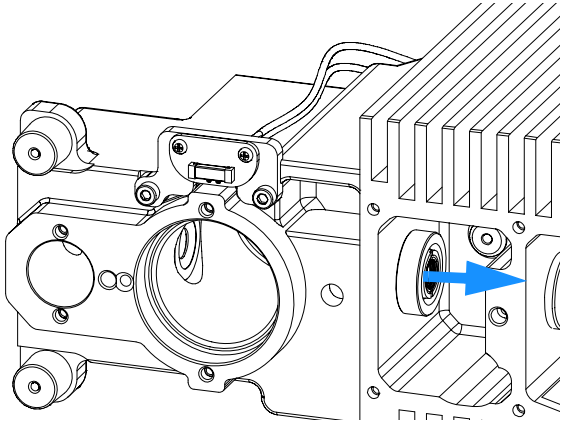
2 Pull the filter motor off the shaft. Keep the spring and the lever fixture in a safe place. Remove the filter lever on the other side.



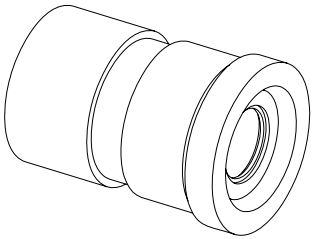
3 Use the 1.5-mm hexagonal key to loosen the setscrew that secures the source lens assembly.



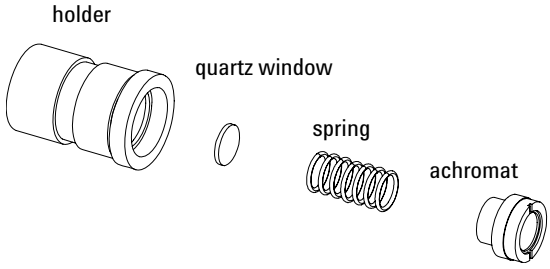
4 Carefully slide the cell support assembly to the right by pushing it from the deuterium lamp side with a hexagonal wrench.



5 Remove the achromat assembly.



6 Use a metal blade (12-mm width, 1-mm thick) to unscrew the lens achromatic.



Cleaning Steps:

7 Place the parts on a clean tissue.

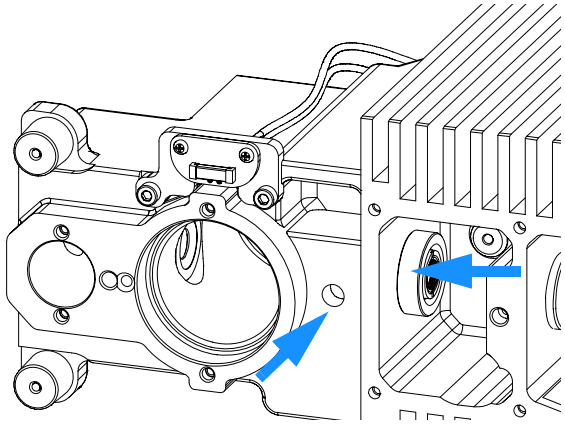
8 Remove the spring and the spectro window from the holder.

9 Clean (with alcohol and lint-free cloth) or replace the spectro window.

Do not clean the achromatic lens with any liquid. To clean use dry air only or use a new one.

10 Replace all parts into the holder and tighten the lens achromatic with the metal blade.

11 Replace the achromat assembly, move it completely into the optical and fix the setscrew.



Next steps:

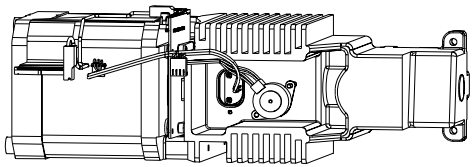
12 Reinstall the Holmium Filter assembly, see "Replacing the Holmium Oxide Filter Motor" on page 286.

Replacing the Holmium Oxide Filter Motor

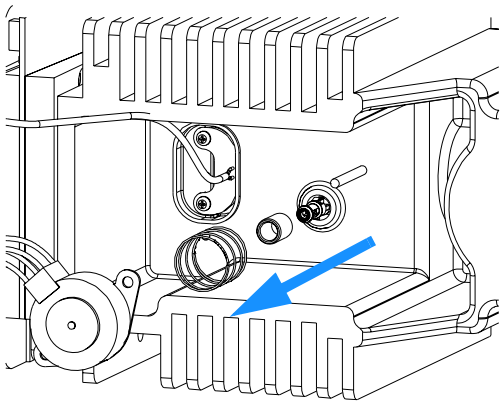
When required	If defective
Tools required	Screwdriver POZI 1 PT3 hexagonal key 3 mm
Parts required	Filter motor assembly G1315-68700 (includes filter lever G1315-45001 and spring 1460-1510) For others see "Holmium Oxide Filter" on page 333
Preparations	• Turn off the lamp. • Switch off the detector, and disconnect the power cable. • Remove detector from stack and place it on working bench. • Remove front cover, top cover and top foam section, see "Removing the Top Cover and Foam" on page 260. • Remove optical unit, see "Removing the Optical Unit" on page 281.

NOTE If the filter motor was removed, the filter lever should not be reused. Always use a new filter lever to assure correct fit on the filter motor shaft.

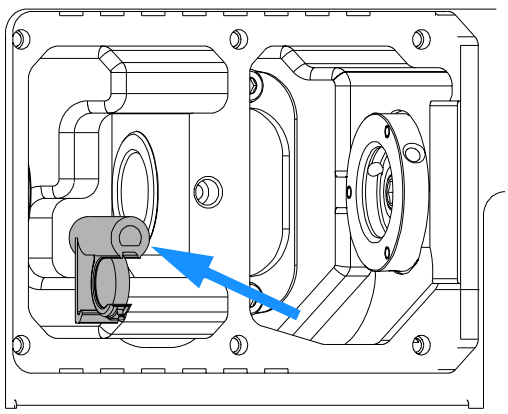
1 Place the optical unit on your bench.



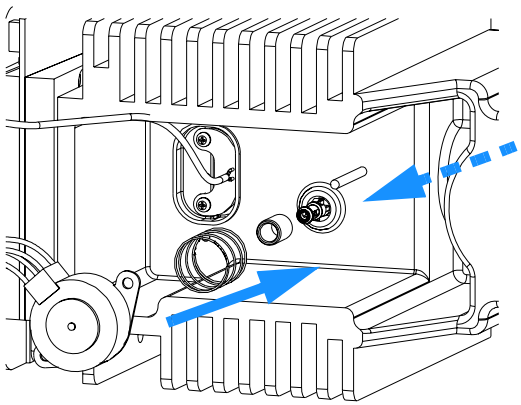
2 Pull the filter motor off the shaft. Keep the spring and the lever fixture in a safe place. Remove the filter lever on the other side.



3 Before installing the filter motor, press the filter lever in from the other side.



4 While counter-holding the filter lever, insert the filter motor onto the filter shaft until it clicks into the final position.



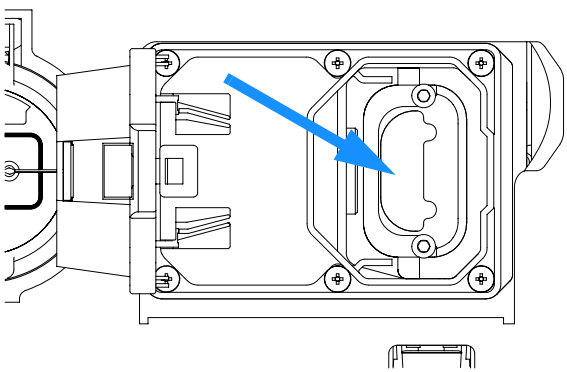
Next steps:

5 Check that the filter lever is moveable.
6 Reinstall the optical unit, see "Installing the Optical Unit" on page 297.
7 Reconnect the filter motor cable to connector J18 on the detector main board.
8 Reinstall the front cover, top cover and top foam section, see "Replacing the Foam and the Top Cover" on page 299.
9 Replace the detector into the stack.
10 Reconnect the power cable and turn on detector.

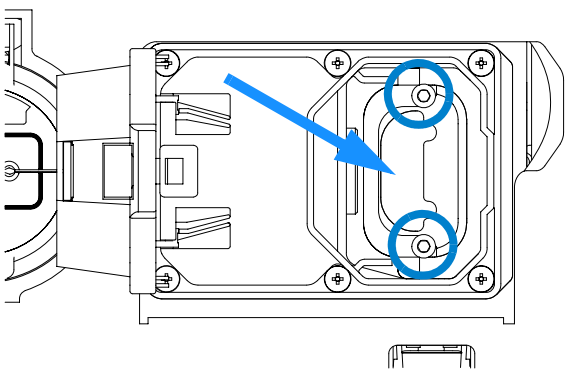
Replacing the Tag Reader (Flow Cell) or the Cell Rotation Limiter

When required	If defective
Tools required	Screwdriver POZI 1 PT3 Hexagonal key 2.5 mm Tweezers
Parts required	Tag reader assembly (flow cell) G1315-60005 Cell rotation limiter G1315-26100 Screws M3 8 mm lg 0515-1040
Preparations	• Turn off the lamp. • Switch off the detector, and disconnect the power cable. • Remove detector from stack and place it on working bench. • Remove front cover, top cover and top foam section, see "Removing the Top Cover and Foam" on page 260. • Remove optical unit, see "Removing the Optical Unit" on page 281.

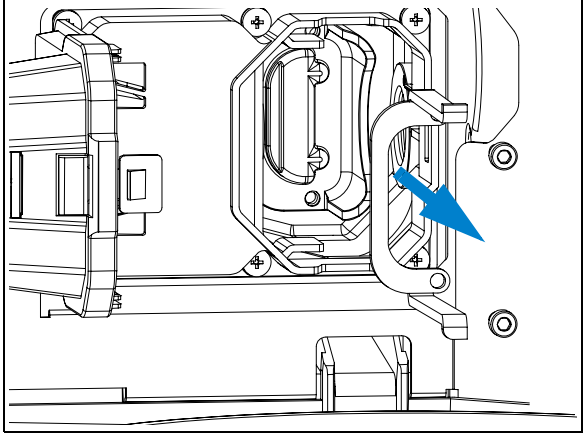
1 Place the optical unit on your bench and locate the cell rotation limiter and tag reader in the flow cell area (view from top).



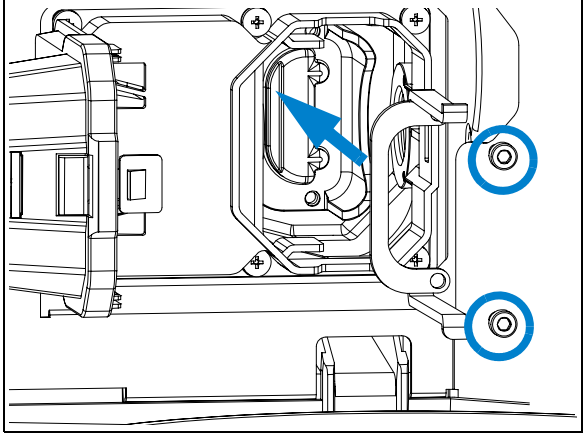
2 Unscrew the two screws using a 2.5 mm hex key.



3 Remove the cell rotation limiter and tag reader assembly.



4 Route the tag reader cable through the hole. Insert the new tag reader assembly together with the cell rotation limiter and fix the two screws.



Next steps:

5 Reinstall the optical unit, see "Installing the Optical Unit" on page 297.

6 Reconnect all cables to the mainboard.

7 Reinstall the front cover, top cover and top foam section, see "Replacing the Foam and the Top Cover" on page 299.

8 Replace the detector into the stack.

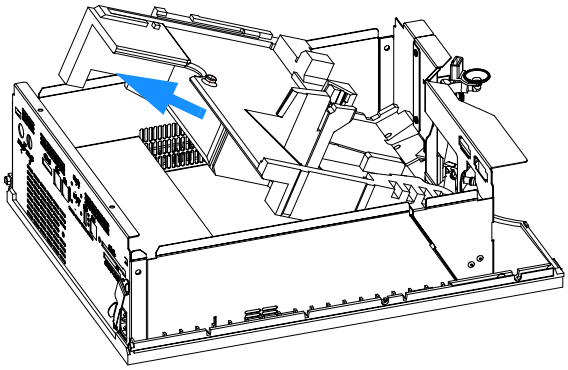
9 Reconnect the power cable and turn on detector.

Exchanging the Power Supply

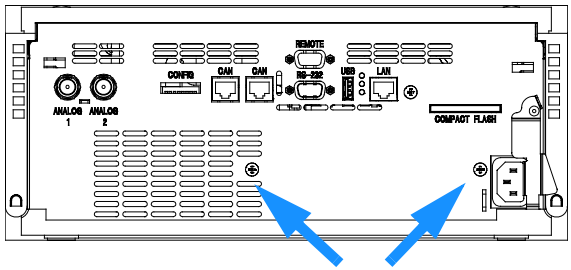
When required	If defective
Tools required	Screwdriver POZI 1 PT3 Wrench 1/4 inch Wrench 5 mm Wrench 7 mm
Parts required	Power supply 0950-2528
Preparations	• Turn off the lamp. • Switch off the detector, and disconnect the power cable. • Remove detector from stack and place it on working bench. • Remove front cover, top cover and top foam section, see "Removing the Top Cover and Foam" on page 260. • Remove the fan assembly, see "Replacing Fan Parts" on page 273. • Remove the detector main board, see "Exchanging the Detector Main Board" on page 263. • Remove optical unit, see "Removing the Optical Unit" on page 281.

NOTE The repair level of the power supply assembly is exchanging the complete assembly. No serviceable parts are inside.

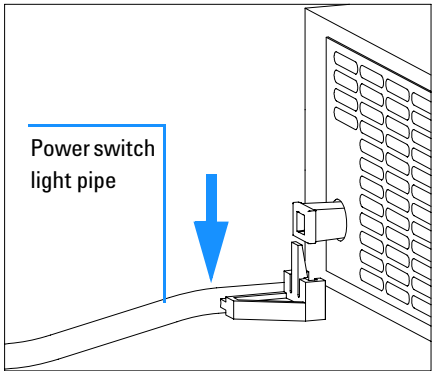
1 Carefully remove the bottom foam part by sliding it out towards the rear.



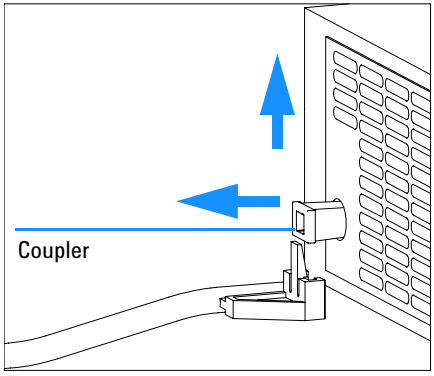
2 Unscrew the power supply at the rear of the module.



3 Press down the power switch light pipe to remove it from the coupler.

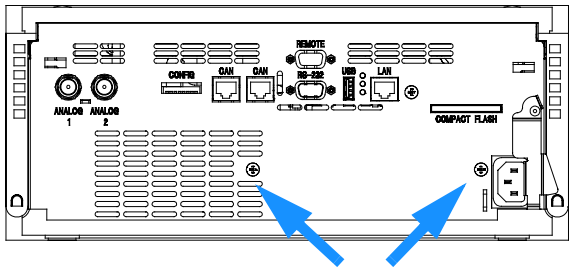


4 Remove the power supply completely.
Re-use the coupler on the new power supply.

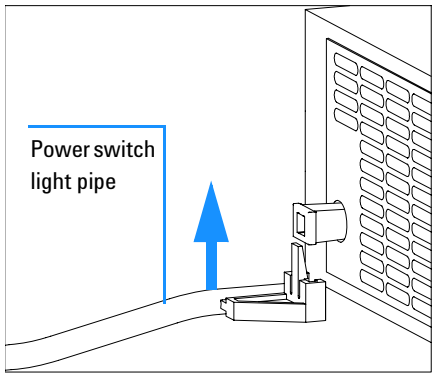


The repair level of the power supply assembly is exchange of the complete assembly. No serviceable parts inside.

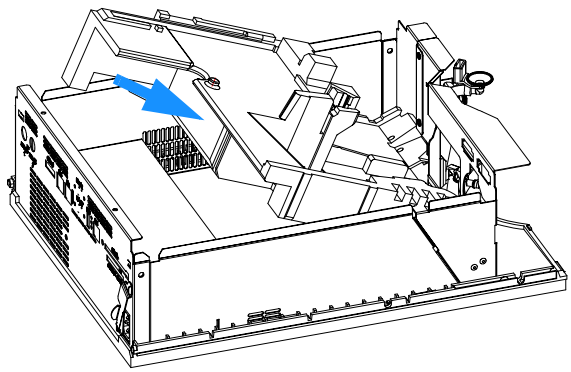
5 Insert the power supply into its location and fix it with the screws at the rear panel.



6 Press down and clip in the power switch light pipe into the power supply.



7 Reinstall bottom foam part. Slide it in underneath the leak drain.



Next steps:

8 Reinstall the processor board, see "Exchanging the Detector Main Board" on page 263.

9 Reinstall the fan assembly, see "Replacing Fan Parts" on page 273.

10 Reinstall the optical unit, see "Installing the Optical Unit" on page 297.

11 Reinstall the front cover, top cover and top foam section, see "Replacing the Foam and the Top Cover" on page 299.

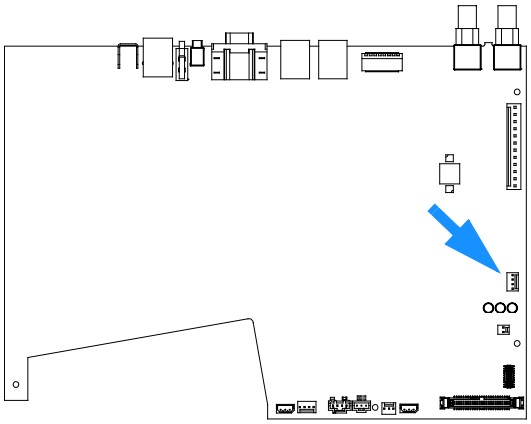
12 Replace detector into the stack.

13 Reconnect the power cable and turn on the detector.

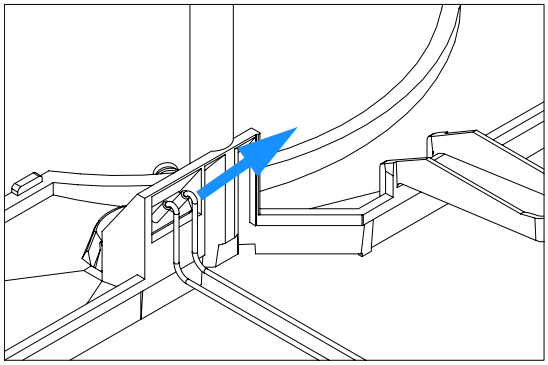
Exchanging the Leak Sensor

When required	If defective
Tools required	Screwdriver POZI 1 PT3
Parts required	Leak sensor assembly 5061-3356
Preparations	• Turn off the lamp. • Switch off the detector, and disconnect the power cable. • Remove detector from stack and place it on working bench. • Remove front cover, top cover and top foam section, see "Removing the Top Cover and Foam" on page 260. • Remove optical unit, see "Removing the Optical Unit" on page 281.

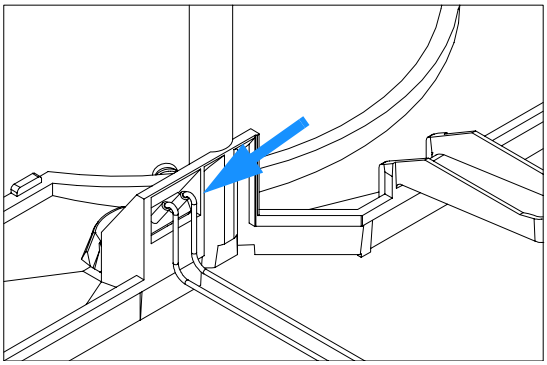
1 Disconnect the leak sensor cable from the detector main board.



2 Remove the leak sensor assembly from the leak pan.



3 Replace the leak sensor assembly into the leak pan.



Next steps:

4 Reconnect the leak sensor cable to the detector main board.

5 Replace the optical unit, see "Installing the Optical Unit" on page 297.

6 Replace the front cover, top cover and top foam section, see "Replacing the Foam and the Top Cover" on page 299.

7 Replace the detector into the stack.

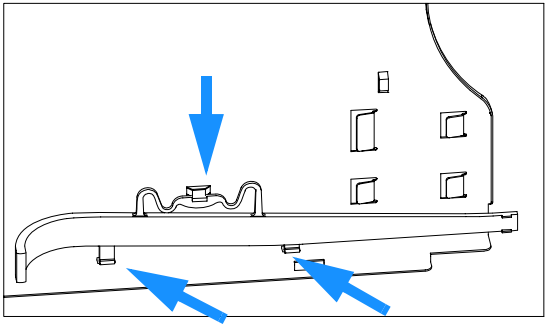
8 Reconnect the cables.

9 Turn on the detector.

Replacing Status Light Pipe

When required	If part was broken or removed
Tools required	Screwdriver POZI 1 PT3
Parts required	Status light pipe 5041-8384
Preparations	• Turn off the lamp. • Switch off the detector, and disconnect the power cable. • Remove detector from stack and place it on working bench. • Remove front cover, top cover and metal cover, see "Removing the Top Cover and Foam" on page 260 (do not remove the foam).

1 The status light pipe is clipped into the top cover.



Next steps:

2 Replace the top cover, see "Replacing the Foam and the Top Cover" on page 299.

3 Replace the detector into the stack and reconnect the cables and capillaries.

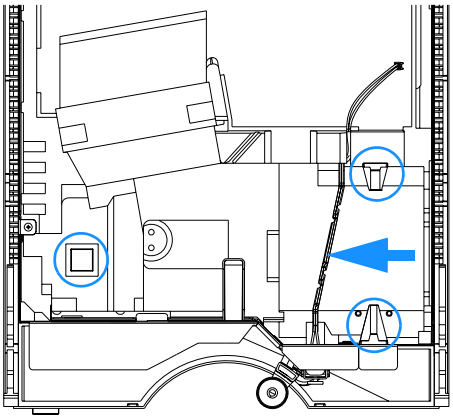
4 Turn on the detector.

Installing the Optical Unit

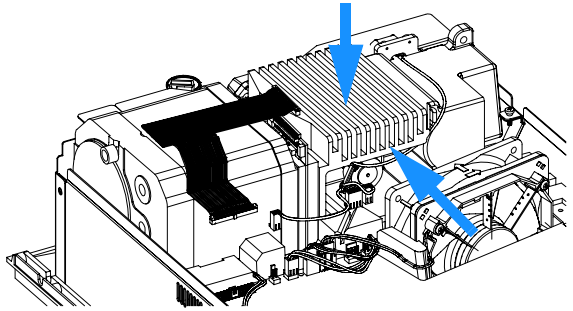
When required	When repairs have been completed
Tools required	Screwdriver POZI 1 PT3 ESD kit.
Preparations	The power supply, the fan and the processor board are already installed.

NOTE The fan must be installed in the correct orientation to ensure correct cooling and operation of the detector, see "Replacing Fan Parts" on page 273.

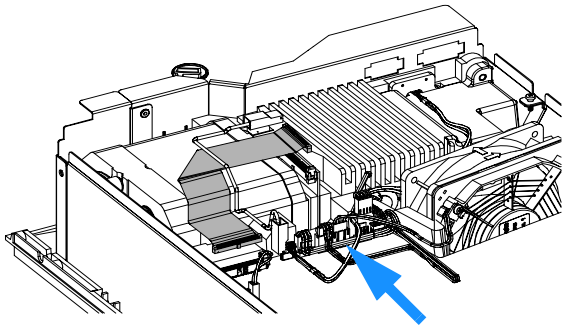
1 Check that the three shock absorbers and the leak sensor cable are placed correctly.



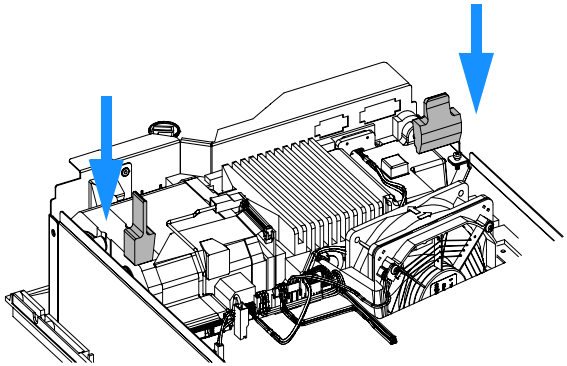
2 Carefully insert the optical unit into the instrument holding the one hand at back of the heat sink.



3 Reconnect all cables to the detector main board: optical, holmium oxide filter motor, ID-cell, ID-lamp.



4 Replace the two rubber shock absorbers.



Next steps:

5 Reinstall the flow cell cover, see "Correcting Leaks" on page 239.

6 Reinstall the flow cell, see "Exchanging a Flow Cell" on page 211.

7 Reinstall the lamps, see "Exchanging a Lamp" on page 209.

8 Reinstall the front cover, top cover and top foam section, see "Replacing the Foam and the Top Cover" on page 299.

9 Replace detector into the stack.

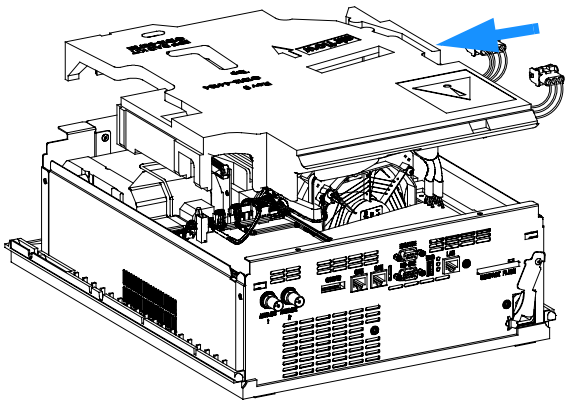
10 Reconnect the power cable and turn on the detector.

NOTE If a new optical is installed or a new detector main board, perform a "Wavelength Verification and Recalibration" on page 176 to add the recalibration parameters into the detector main board's memory.

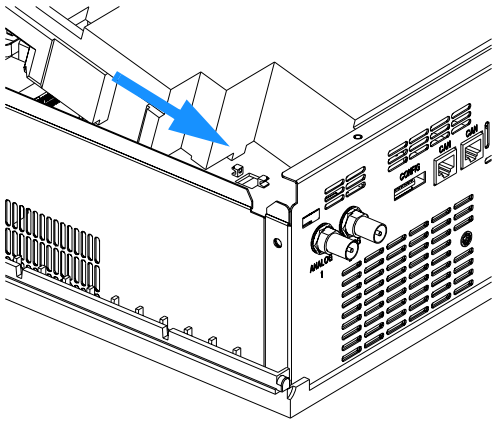
Replacing the Foam and the Top Cover

When required	When all repairs have been completed
Tools required	Screwdriver POZI 1 PT3
Prerequisites	The detector is open and other procedures have been carried out.
Preparations	The optical unit, power supply, the fan and the detector main board are already installed.

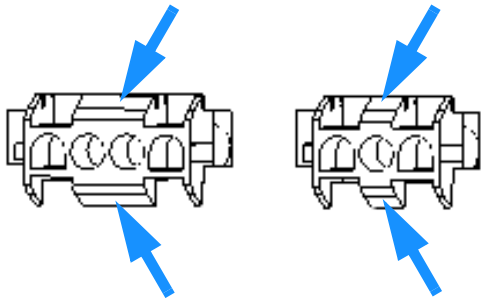
1 Route the lamp connector cables through the hole in the foam.



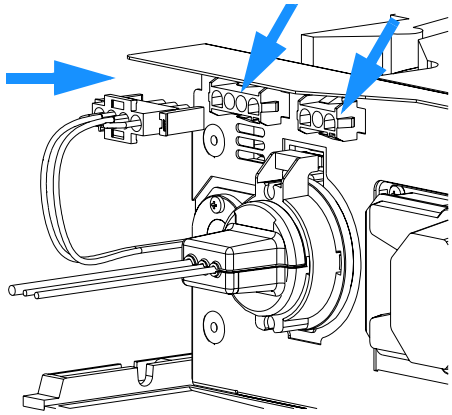
2 Insert the foam and make sure that the foam is installed correctly.



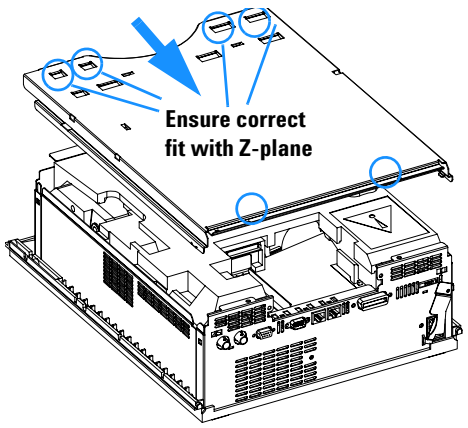
3 Press the lamp cables into the foam channel and reconnect the lamp connectors to the front panel.



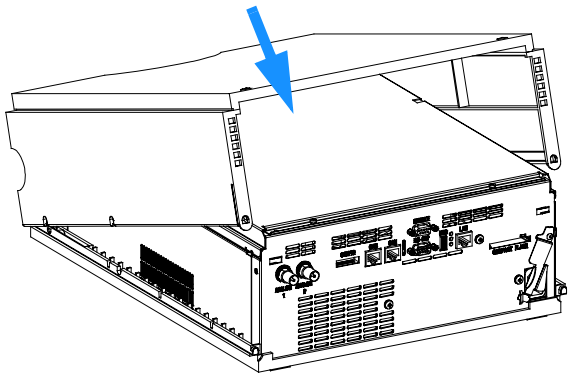
4 Reconnect the lamps.



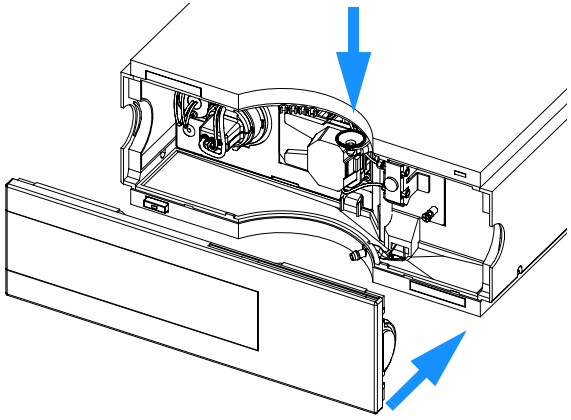
5 Slide the top plate towards the rear and fix the top plate screws.



6 Replace the cover.



7 Replace waste funnel assembly and the front panel.



Next steps:

8 Replace the detector into the stack.

9 Reconnect the hydraulic connections.

10 Reconnect the power cable and turn on the detector.

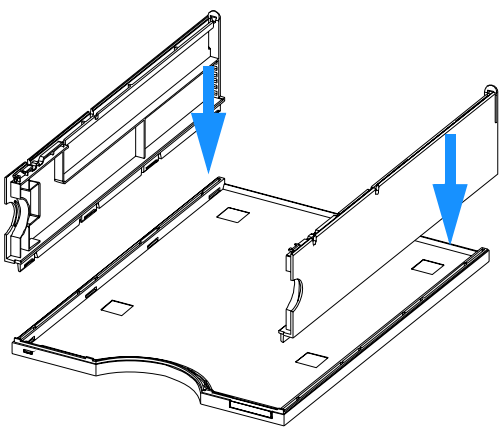
Assembling the Main Cover

When required	If cover is broken
Tools required	None
Parts required	Plastics kit 5062-9985 (includes base, top, left and right)
Preparations	The plastics kit is not assembled.

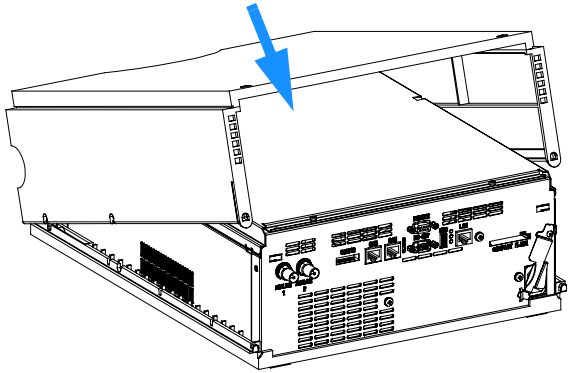
NOTE The plastics kit contains all parts, but it is not assembled.

WARNING **In case you insert the left or right side in the opposite position, you may not be able to remove the side from the top part.**

1 Place the top part on the bench and insert the left and right side into the top part.



2 Replace the cover.



14
Parts and Materials for Maintenance

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Standard Flow Cell 307
Semi-Micro Flow Cell 309
Micro Flow Cell 311
High Pressure Flow Cell 313
Prep Flow Cell - SST 315
Prep Flow Cell - Quartz 317
Nano Flow Cells 319
Accessory Kit 323

This chapter provides information on parts for maintenance.

Overview of Maintenance Parts

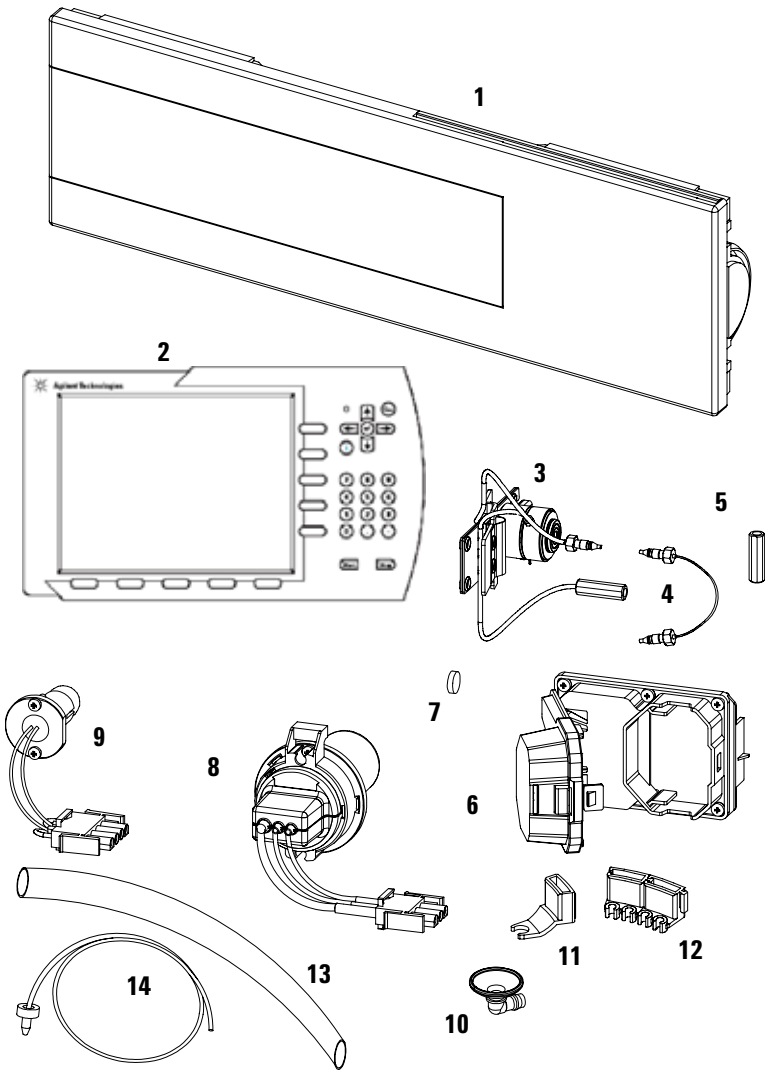


Figure 101 Maintenance Parts

Table 27 Maintenance Parts

Item	Description	Part Number
1	Front cover	5065-9982
2	Instant Pilot G4208A (firmware revision B.01.02 or above for G1315C/G1365C and B.02.01 or above for G1315D/G1365D)	G4208-67001
	Control Module G1323B (firmware revision must be B.04.02 or above)	G1323-67011
3	Flow Cells with ID tag. For details see "Standard Flow Cell" on page 307, "Semi-Micro Flow Cell" on page 309, "Micro Flow Cell" on page 311, "High Pressure Flow Cell" on page 313 or "Nano Flow Cells" on page 319	
4	Capillary column – detector 380 mm lg, 0.17 i.d., for details see "Accessory Kit" on page 323	G1315-87311
	Capillary column – detector 150 mm lg, 0.17 i.d., for details see "Accessory Kit" on page 323	G1315-87303
5	Zero dead volume fitting	5022-6515
6	Flow cell door (seal included) Screw special for flow cell door	G1315-68707 5022-2112
7	Holmium oxide filter	79880-22711
8	Longlife Deuterium lamp **with ID tag** (with black cover) ("C" version)	2140-0820
9	Tungsten lamp	G1103-60001
10	Leak funnel	5041-8388
11	Leak funnel holder	5041-8389
12	Clip	5041-8387
13	Corrugated tubing, 120 mm lg, re-order 5 m	5062-2463
14	Teflon Tubing flexible i.d. 0.8 mm (flow cell to waste), see "Accessory Kit" on page 323	5062-2462
	Cable CAN to Agilent 1200 Series modules (0.5 m)	5181-1516
	Cable CAN to Agilent 1200 Series modules (1 m)	5181-1519
	LAN Communication Interface Board (G1369A)	G1369-60001
	Cross-over network cable (shielded, 3 m long) for point to point connection	5023-0203
	Twisted pair network cable (shielded, 7 m long), for hub connections	5023-0202

Table 27 Maintenance Parts, continued

Item	Description	Part Number
	Analog cable (BNC to general purpose, spade lugs)	01046-60105
	CompactFlash Card Kit	01100-68700

Standard Flow Cell

Table 28 Standard Flow Cell Parts

Item	Description	Part Number
	Standard flow cell assembly, 10 mm, 13 µl, maximum pressure 120 bar (12 MPa), with RFID tag	G1315-60022
1	Window screw	79883-22402
2	Spring washers, pack of 10	5062-8553
3	Compression washer	79883-28801
4	Window holder	79883-22301
5	Quartz window	1000-0488
6	Gasket BACK (Teflon), 2.3 mm hole, outlet side	See kits below
7	Gasket FRONT (Teflon), 1.3 mm hole, inlet side	See kits below
8	Window assembly, comprises item 1, 2, 3, 4, 5	No part number
9	Capillary IN (0.17 mm, 590 mm lg) including heat exchanger	G1315-87321
10	Capillary OUT (0.17 mm, 200 mm lg)	G1315-87302
11	Clamp unit	G1315-84910
	Screw M 2.5, 4 mm lg for cell body/clamp	0515-1056
	Zero dead volume fitting	5022-2184
	Cell repair kit STD, includes window screw kit, 4 mm hexagonal wrench and seal kit	G1315-68712
	Seal kit BACK for STD flow cell, qty=12 of item 6	G1315-68711
	Seal kit FRONT for STD flow cell, qty=12 of item 7	G1315-68710
	Window screw kit, includes 2 quartz windows, 2 compression washers, 2 window holders, 2 window screws and 10 spring washers	79883-68703

NOTE

Gaskets # 6 and #7 have different hole diameters.

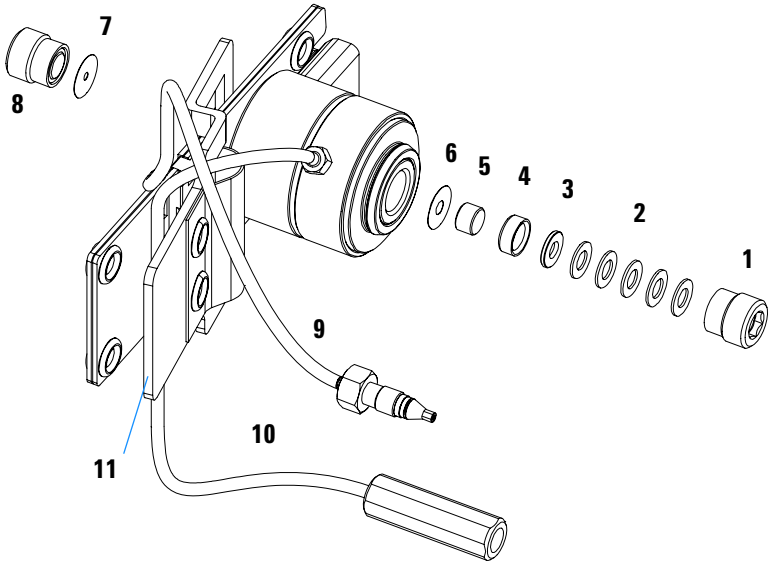


Figure 102 Standard Flow Cell Parts

NOTE Gaskets # 6 and #7 have different hole diameters.

1 - window screw
2 - spring washers
3 - compression washer
4 - window holder
5 - quartz window
6 - Gasket

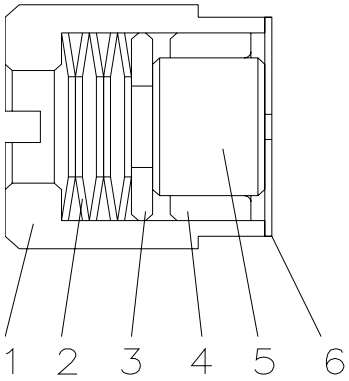


Figure 103 Orientation of Spring Washers.

Semi-Micro Flow Cell

Table 29 Semi-Micro Flow Cell Parts

Item	Description	Part Number
	Semi-micro flow cell assembly, 6 mm, 5 µl, maximum pressure 120 bar (12 MPa), with RFID tag	G1315-60025
1	Window screw	79883-22402
2	Spring washers, pack of 10	5062-8553
3	Compression washer	79883-28801
4	Window holder	79883-22301
5	Quartz window	1000-0488
6	Gasket BACK (Teflon), 1.8 mm hole, outlet side	See kits below
7	Gasket FRONT (Teflon), 1.3 mm hole, inlet side	See kits below
8	Window assembly, comprises item 1, 2, 3, 4, 5	No part number
9	Capillary IN (0.17 mm, 310 mm lg) including heat exchanger	G1315-87319
10	Capillary OUT (0.12 mm, 200 mm lg)	G1315-87306
10	Capillary OUT (0.17 mm, 200 mm lg)	G1315-87302
11	Clamp unit	G1315-84910
	Screw M 2.5, 4 mm lg for cell body/clamp	0515-1056
	Zero dead volume fitting	5022-2184
	Cell repair kit semi-micro, includes window screw kit, 4 mm hexagonal wrench and seal kits	G1315-68713
	Seal kit BACK for semi-micro flow cell, qty=12 of item 6	79883-68702
	Seal kit FRONT for semi-micro flow cell, qty=12 of item 7	G1315-68710
	Window screw kit, includes 2 quartz windows, 2 compression washers, 2 window holders, 2 window screws and 10 spring washers	79883-68703

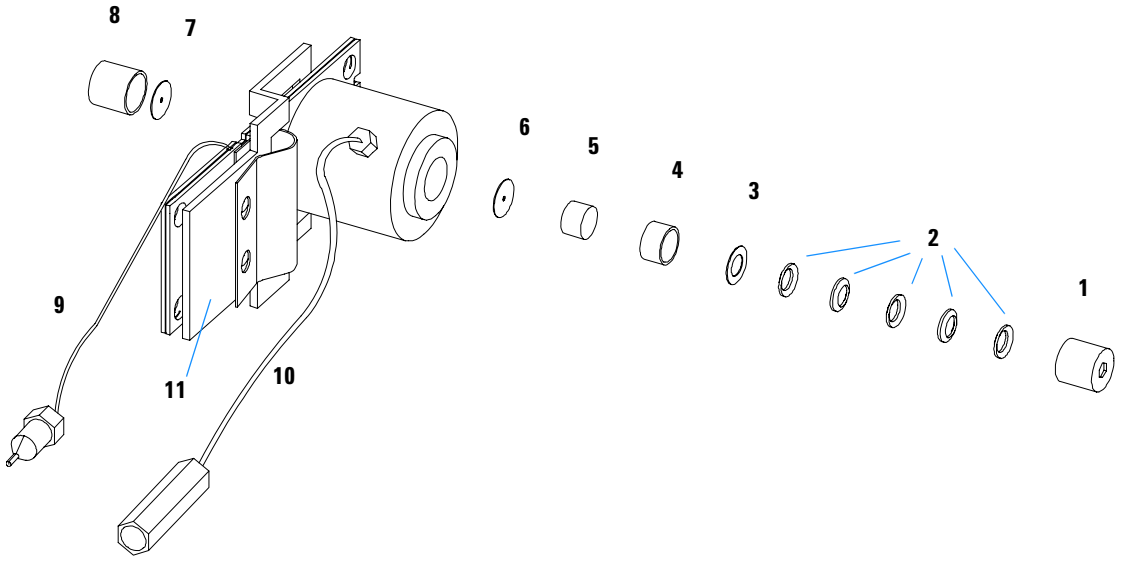


Figure 104 Semi-Micro Flow Cell Parts

NOTE Gaskets # 6 and #7 have different hole diameters.

1 - window screw
2 - spring washers
3 - compression washer
4 - window holder
5 - quartz window
6 - Gasket

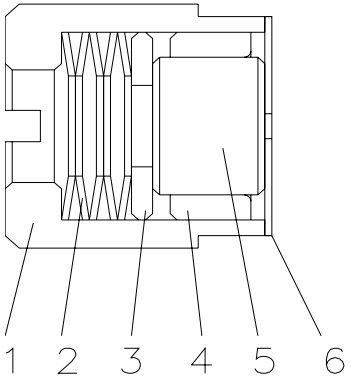


Figure 105 Orientation of Spring Washers.

Micro Flow Cell

Table 30 Micro Flow Cell Parts

Item	Description	Part Number
	Micro flow cell assembly, 3 mm, 2 µl, maximum pressure 120 bar (12 MPa), with RFID tag	G1315-60024
1	Window screw	79883-22402
2	Spring washers, pack of 10	5062-8553
3	Compression washer	79883-28801
4	Window holder	79883-22301
5	Quartz window	1000-0488
6	Gasket BACK (Teflon), 1.8 mm hole, outlet side	See kits below
7	Gasket FRONT (Teflon), 1.3 mm hole, inlet side	See kits below
8	Window assembly, comprises item 1, 2, 3, 4, 5	No part number
9	Capillary IN (0.12 mm, 310 mm lg) including heat exchanger	G1315-87339
10	Capillary OUT (0.12 mm, 200 mm lg)	G1315-87306
10	Capillary OUT (0.17 mm, 200 mm lg)	G1315-87302
11	Clamp unit	G1315-84910
	Screw M 2.5, 4 mm lg for cell body/clamp	0515-1056
	Zero dead volume fitting	5022-2184
	Cell repair kit semi-micro, includes window screw kit, 4 mm kexagonal wrench and seal kits	G1315-68713
	Seal kit BACK for semi-micro flow cell, qty=12 of item 6	79883-68702
	Seal kit FRONT for semi-micro flow cell, qty=12 of item 7	G1315-68710
	Window screw kit, includes 2 quartz windows, 2 compression washers, 2 window holders, 2 window screws and 10 spring washers	79883-68703

NOTE

Gaskets # 6 and #7 have different hole diameters.

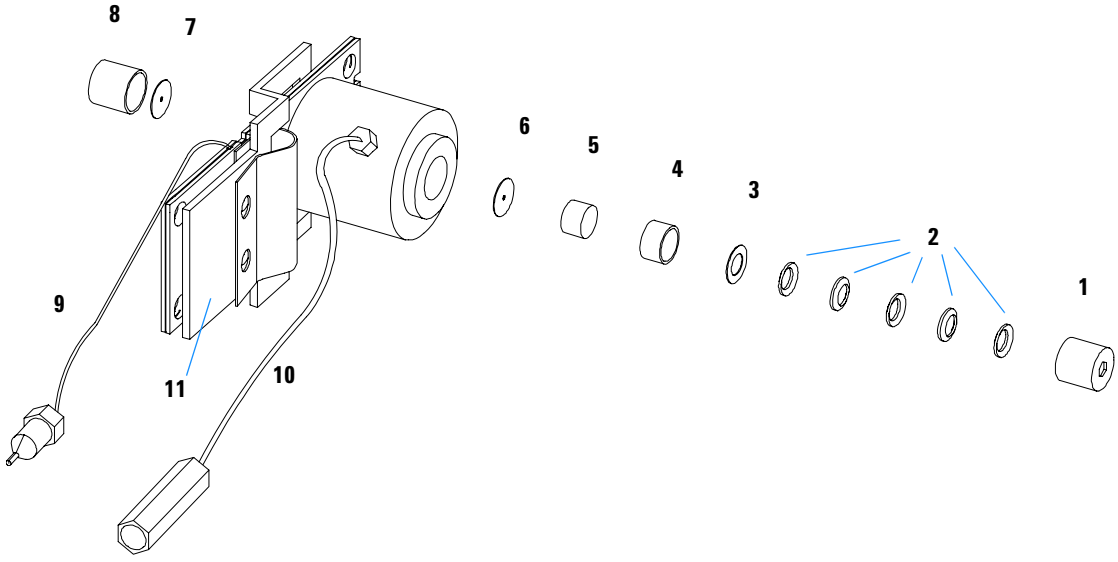


Figure 106 Micro Flow Cell Parts

1 - window screw
2 - spring washers
3 - compression washer
4 - window holder
5 - quartz window
6 - Gasket

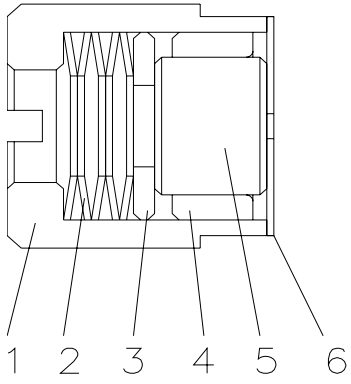


Figure 107 Orientation of Spring Washers.

High Pressure Flow Cell

Table 31 High Pressure Flow Cell Parts

Item	Description	Part Number
	High pressure flow cell assembly, 6 mm, 1.7 µl, maximum pressure 400 bar (40 MPa), with RFID tag	G1315-60015
1	Window assembly, comprises items 2, 3, 4, 5 and 6	
2	Seal ring	79883-27101
3	Quartz window	1000-0953
4	Compression washer	79883-28802
5	Spring washers (pack of 10)	5062-8553
6	Window screw	79883-22404
7	Capillary IN (0.12 mm, 290 mm lg) including heat exchanger	G1315-87325
8	Capillary OUT (0.12 mm, 200 mm lg)	G1315-87306
9	Clamp unit	G1315-84901
	Screw M 2.5, 4 mm lg for cell body/clamp unit	0515-1056
	Capillary (0.12 mm, 150 mm lg)	G1315-87312
	Capillary (0.17 mm, 380 mm lg)	G1315-87311
	High Pressure Cell Repair Kit, includes 1 quartz window, 1 compression washer, 5 spring washers, 2 seal rings	79883-68700

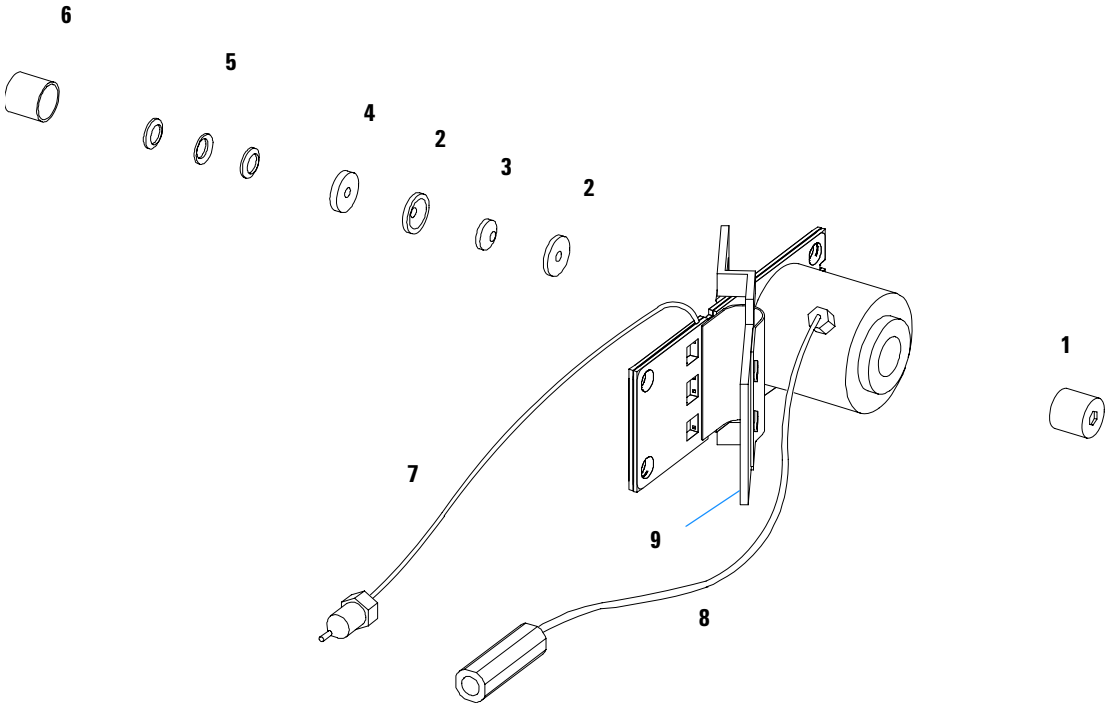


Figure 108 High Pressure Flow Cell Parts

Prep Flow Cell - SST

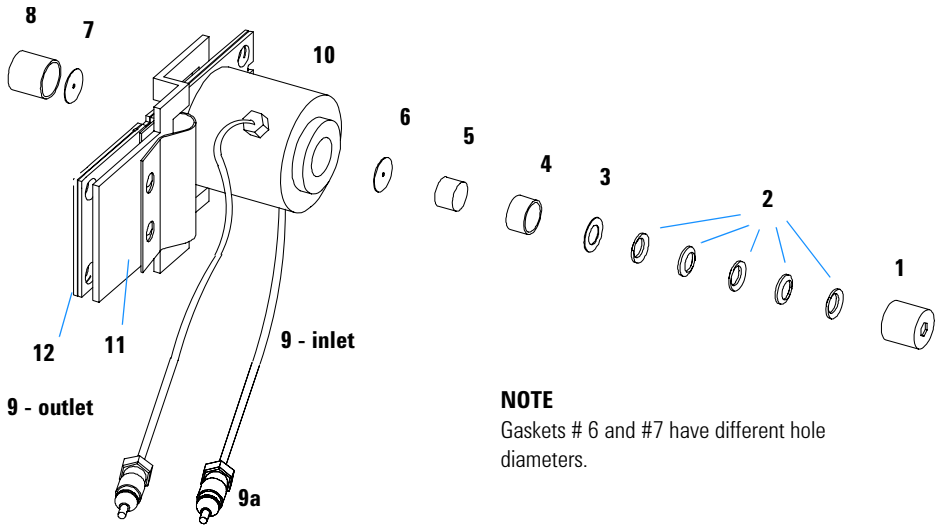
NOTE For more details on the Preparative Flow Cells refer to the technical note that comes with the flow cells.

Table 32 Prep Flow Cell - SST Parts

Item	Description	Part Number
	Prep Flow Cell SST - 3 mm, 120 bar (12 MPa), with RFID Tag completely assembled, includes all items below	G1315-60016
1	Window screw	79883-22402
2	Spring washers, pack of 10	5062-8553
3	Compression washer	79883-28801
4	Window holder	79883-22301
5	Quartz window	1000-0488
6	Gasket BACK (FEP Teflon), 2.3 mm hole, outlet side Seal kit BACK for STD flow cell, qty=12	G1315-68711
7	Gasket FRONT (FEP Teflon), 1.3 mm hole, inlet side Seal kit FRONT for STD flow cell, qty=12	G1315-68710
8	Window assembly, comprises item 1, 2, 3, 4, 5	No part number
	Window screw kit, includes 2 quartz windows, 2 compression washers, 2 window holders, 2 window screws and 10 spring washers	79883-68703
	Cell repair kit semi-micro, includes window screw kit, 4 mm kexagonal wrench and seal kits	G1315-68713
9	Capillary SST, 250 mm length, 0.5 mm i.d., o.D. 0.9 mm with fittings for flow cell assembled	G1315-87305
9a	Fitting FRONT, Fitting BACK, Fitting 1/16”, re-order 10/pk	5062-2418
10	Cell body	G1315-27706

Table 32 Prep Flow Cell - SST Parts, continued

Item	Description	Part Number
11	Handle for clamp unit	G1315-84901
12	Clamp unit	G1315-84902
13	Screw M 2.5, 4 mm lg for cell body/clamp	0515-1056



NOTE
Gaskets # 6 and #7 have different hole diameters.

Figure 109 Prep Flow Cell - SST Parts

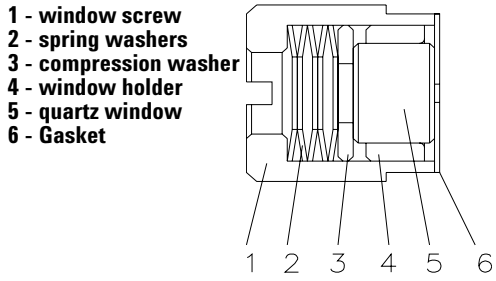


Figure 110 Orientation of Spring Washers.

Prep Flow Cell - Quartz

NOTE For more details on the Preparative Flow Cells refer to the technical note that comes with the flow cells.

Table 33 Prep Flow Cell - Quartz Parts

Item	Description	Part Number
	Prep Flow Cell Quartz, 0.3 mm, 20 bar (2 MPa) completely assembled, includes all items below	G1315-60017
	Prep Flow Cell Quartz, 0.06 mm, 20 bar (2 MPa) completely assembled, includes all items below	G1315-60018
1	PTFE tubing 2 m length, 0.8 mm i.d., o.D. 1.6 mm with fittings for flow cell assembled (see note below)	G1315-67301
	PTFE tubing 80 cm length, 0.5 mm i.d., o.D. 1.6 mm with fittings for flow cell assembled (see note below)	G1315-67302
2	Fitting - fingertight (2/pk)	0100-1516
3	Cell housing	G1315-27705
4	Handle for clamp unit	G1315-84901
5	Clamp unit	G1315-84902
6	Screw M 2.5, 4 mm lg for cell body/clamp	0515-1056
7	Quartz body - Prep Cell 0.3 mm	G1315-80004
7	Quartz body - Prep Cell 0.06 mm	G1315-80003

NOTE The flow cell comes with two tubings 0.8 mm i.d. and one 0.5 mm i.d. so that the combination at the flow cell could be either 0.8/0.8 or 0.5/0.8 (inlet/outet)

Standard is 0.8/0.8. Depending on the system pressure (< 30 ml/min) or bandbroadening, the inlet tubing might be changed to 0.5 mm.

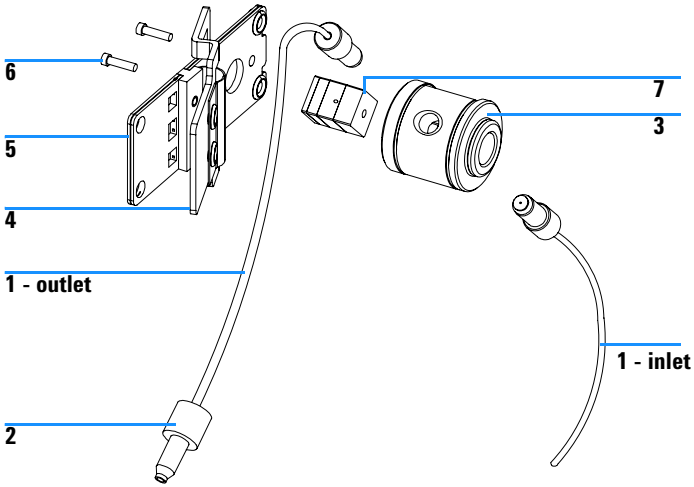


Figure 111 Prep Flow Cell - Quartz Parts

Nano Flow Cells

The following kits are available:

Table 34 Nano-flow cell kits

Description	Part number
500 nl Flow Cell Kit includes Flow cell assembly (10 mm, 500 nl, 5 MPa) completely assembled (includes items 1, 2, 3, 4, 10, 11, 12, 13, 14, 15, and 16)	G1315-68724
80 nl Flow Cell Kit includes Flow cell assembly (10 mm, 80 nl, 5 MPa) completely assembled (includes items 1, 2, 3, 4, 10, 11, 12, 13, 14, 15, and 16)	G1315-68716

Figure 112 shows all parts delivered with the nano-flow cell kits.

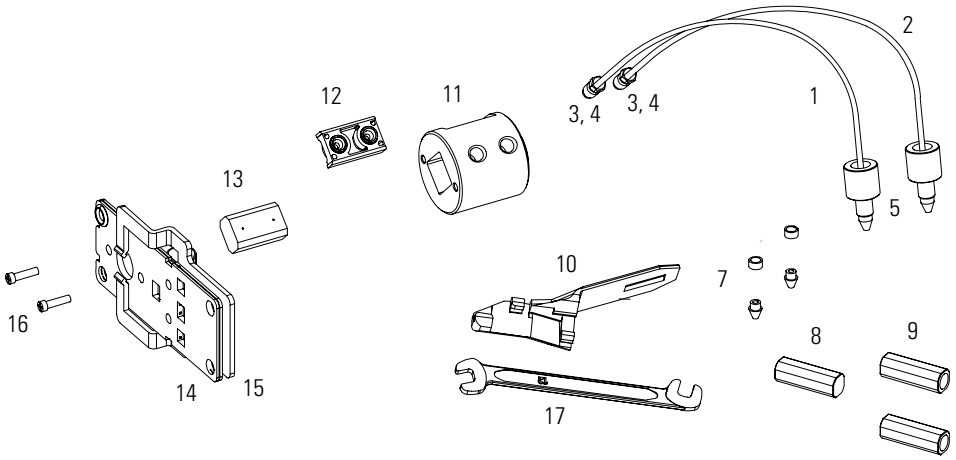


Figure 112 Content of kits

Table 35 lists the generic parts for both nano-flow cells:

Table 35 Generic Parts

Item	Description	Part Number
3	Fitting Screw (for 4 mm wrench), QTY=2 (reorder 10/pk)	5063-6593
4	Cell ferrules are factory installed	
5	PEEK fitting 1/32" (not attached to capillaries), (reorder 10/pk)	5065-4422
7	Litetouch ferrules LT-100, (1/32" Ferrule and SS lock ring), QTY=2 (reorder 10/pk)	5063-6592
8	Union Adjustment Tool, used for item #7	5022-2146
9	ZDV SS Union, no fitting, QTY=2	5022-2184
10	Torque Adapter	G1315-45003
14	Handle for clamp unit	G1315-84902
15	Clamp unit	G1315-84910
16	Screw M 2.5, 4 mm long for cell body/clamp	0515-1056
17	Wrench open end 4 mm (supplied with standard accessory kit G1315-68705 of your detector)	8710-1534

Table 36 lists the specific parts for the 500 nl flow cell.

Table 36 Specific 500 nl Flow Cell Parts

Item	Description	Part Number
	500 nl Flow Cell Kit	G1315-68724
1	PEEK coated fused silica capillary Inlet (100 µm) **pre-mounted to cell**, includes Inlet capillary, 300 mm long, 100 µm i.d. with pre-fixed ferrules (#4) and fittings (#3), plus one PEEK Fitting FT (#5)	G1315-87333
2	PEEK coated fused silica capillary Outlet (100 µm) **pre-mounted to cell**, includes Outlet capillary, 120 mm long, 100 µm i.d. with pre-fixed ferrules (#4) and fitting (#3), plus one PEEK Fitting FT (#5)	G1315-87338
1	PEEK coated fused silica capillary Inlet (50 µm) **alternative**, includes Inlet capillary, 400 mm long, 50 µm i.d. with pre-fixed ferrules (#4) and fittings (#3), plus one PEEK Fitting FT (#5)	G1315-87323
2	PEEK coated fused silica capillary Outlet (50 µm), **alternative**, includes Outlet capillary, 120 mm long, 50 µm i.d. with pre-fixed ferrules (#4) and fitting (#3), plus one PEEK Fitting FT (#5)	G1315-87328
11	Cell Housing (500 nl)	G1315-27703
12	Cell Seal Assembly (500 nl)	G1315-87101
13	Quartz Body (500 nl)	G1315-80001
	Sealing Kit, includes items #10, #12 (QTY=2) and #7 (QTY=5)	G1315-68715

Table 37 lists the specific parts for the 80 nl flow cell.

Table 37 Specific 80 nl Flow Cell Parts

Item	Description	Part Number
	80 nl Flow Cell Kit	G1315-68716
1	PEEK coated fused silica capillary Inlet (50 µm) **pre-mounted to cell**, includes Inlet capillary, 400 mm long, 50 µm i.d. with pre-fixed ferrules (#4) and fittings (#3), plus one PEEK Fitting FT (#5)	G1315-87323
2	PEEK coated fused silica capillary Outlet (50 µm) **pre-mounted to cell**, includes Outlet capillary, 120 mm long, 50 µm i.d. with pre-fixed ferrules (#4) and fitting (#3), plus one PEEK Fitting FT (#5)	G1315-87328
1	PEEK coated fused silica capillary Inlet (25 µm) **alternative**, includes Inlet capillary, 200 mm long, 25 µm i.d. with pre-fixed ferrules (#4) and fittings (#3), plus one PEEK Fitting FT (#5)	G1315-87313
2	PEEK coated fused silica capillary Outlet (25 µm) **alternative**, includes Outlet capillary, 600 mm long, 25 µm i.d. with pre-fixed ferrules (#4) and fitting (#3), plus one PEEK Fitting FT (#5)	G1315-87318
11	Cell Housing (80 nl)	G1315-27704
12	Cell Seal Assembly (80 nl)	G1315-42301
13	Quartz Body (80 nl)	G1315-80002
	Sealing Kit 80 nl cell, includes items #10, #12 (QTY=2), #7 (QTY=5)and Lite Touch Sleeves (QTY=5)	G1315-68725

Accessory Kit

This kit contains some accessories and tools needed for the installation and repair of the detector.

Table 38 Accessory Kit Parts

Item	Description	Part Number
	Accessory kit	G1315-68705
	Corrugated tubing (to waste), re-order 5 m	5062-2463
1	Teflon Tubing flexible i.d. 0.8 mm (flow cell to waste), re-order 5 m	5062-2462
2	Fitting male PEEK, Qty=1	0100-1516
3	Capillary column – detector 380 mm lg, 0.17 i.d. includes items 4, 5 and 6 (not assembled)	G1315-87311
	Capillary column – detector 150 mm lg, 0.17 i.d.	G1315-87303
4	Ferrule front 1/16" SST, qty=2, re-order pack of 10	5180-4108 *
5	Ferrule back 1/16" SST, qty=2, re-order pack of 10	5180-4114 *
6	Fitting 1/16" SST, qty=2, re-order pack of 10	5061-3303 *
	Hex key set 1 – 5 mm	8710-0641
	Wrench open end 1/4 – 5/16 inch	8710-0510
	Wrench open end 4 mm	8710-1534

* or kit 5062-2418 1/16" Fittings and Ferrules (front/back) 10/PK

For item number refer to Figure 113 and Figure 114.

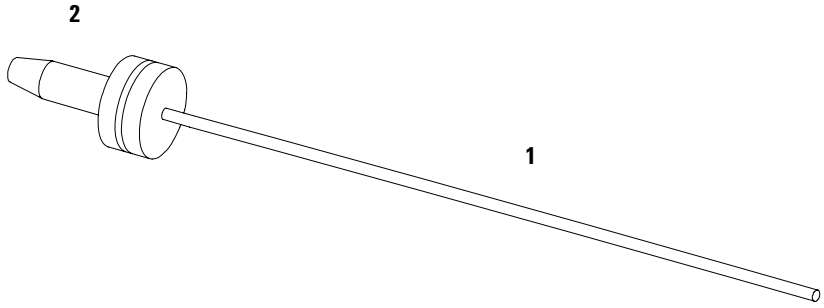


Figure 113 Waste Tubing Parts

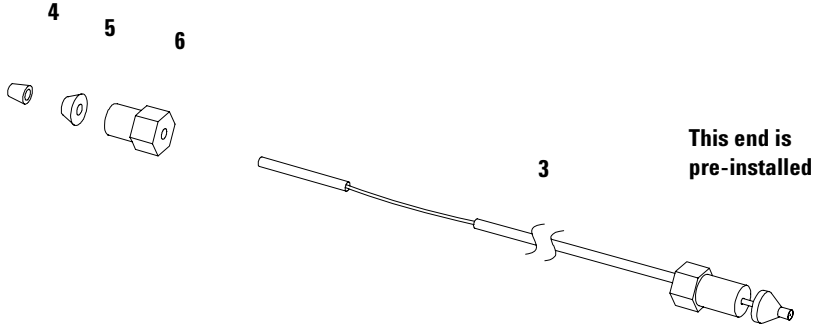


Figure 114 Inlet Capillary (Column-Detector) Parts

15
Parts for Repairs

Parts At The Rear Of The Detector 326
Optical Unit Assembly 328
Coupling Lens Assembly 330
Source Lens (Achromat) Assembly 331
Cell Support Assembly 332
Holmium Oxide Filter 333
Fan Assembly Parts 334
Plastic Parts 335
Leak Parts 336
Foam Parts 337
Power and Status Light Pipes 338
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This chapter provides information on parts for repair.

Parts At The Rear Of The Detector

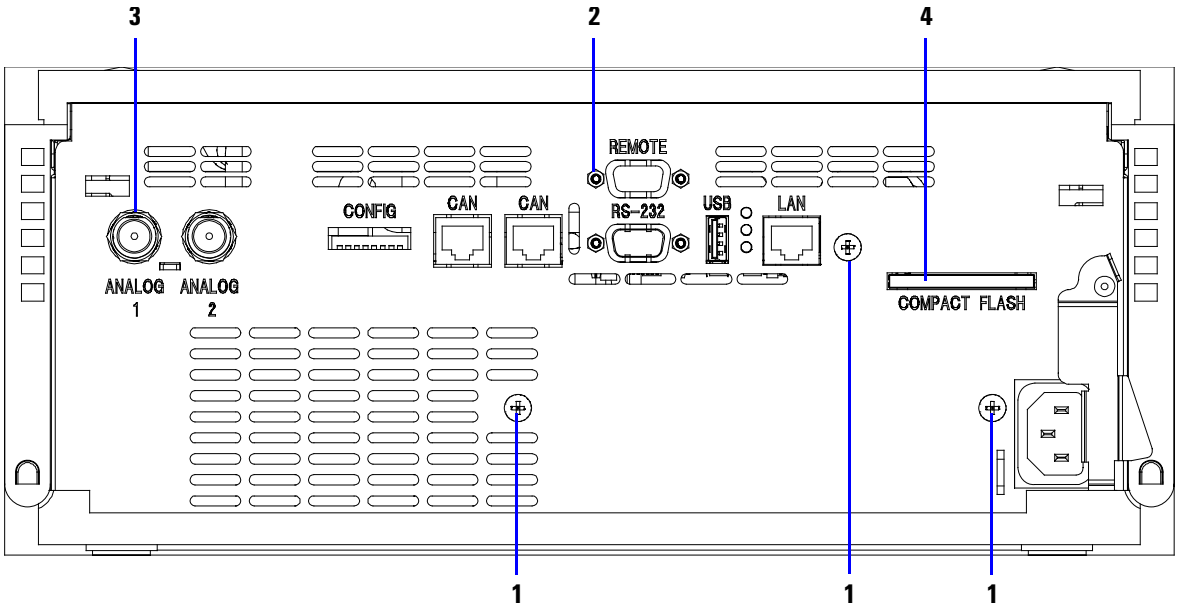

Figure 115 Parts at rear of the detector

NOTE The PCMICIA slot has been removed from all detectors in November 2006 with the introduction of the G1315D DAD and G1365D MWD. See also "Removing the PCMCIA Interface" on page 272.

Table 39 Parts At The Rear Of The Detector Rear Parts

Item	Description	Part Number
	Main board DADM for G1315**C** DAD SL, minimum firmware B.01.01	G1315-66560
	Main board DADM for G1315**C** DAD SL (exchange assembly)	G1315-69560
	Main board MWDM for G1365**C** MWD SL, minimum firmware B.01.01	G1365-66560
	Main board MWDM for G1365**C** MWD SL(exchange assembly)	G1365-69560
	Main board DADM for G1315**D** DAD, minimum firmware B.01.04	G1315-66565
	Main board DADM for G1315**D** DAD (exchange assembly)	G1315-69565
	Main board MWDM for G1365**D** MWD, minimum firmware B.01.04	G1365-66565
	Main board MWDM for G1365**D** MWD (exchange assembly)	G1365-69565
	Power supply, for power and status light parts see page 338	0950-2528
1	Screws M4 8 mm lg	0515-0910
2	Hexagonal nut for remote connector	1251-7788
3	Nut for analog connector	2940-0256
3	Washer for analog connector	2190-0699
4	CompactFlash Card Kit for use with G1315C DAD SL and G1365C MWD SL	01100-68700
	Cable CAN to Agilent 1200 Series modules (0.5 m)	5181-1516
	Cable CAN to Agilent 1200 Series modules (1 m)	5181-1519
	Cross-over network cable (shielded, 3 m long) for point to point connection	5023-0203
	Twisted pair network cable (shielded, 7 m long), for hub connections	5023-0202
	Analog cable (BNC to general purpose, spade lugs)	01046-60105

Optical Unit Assembly

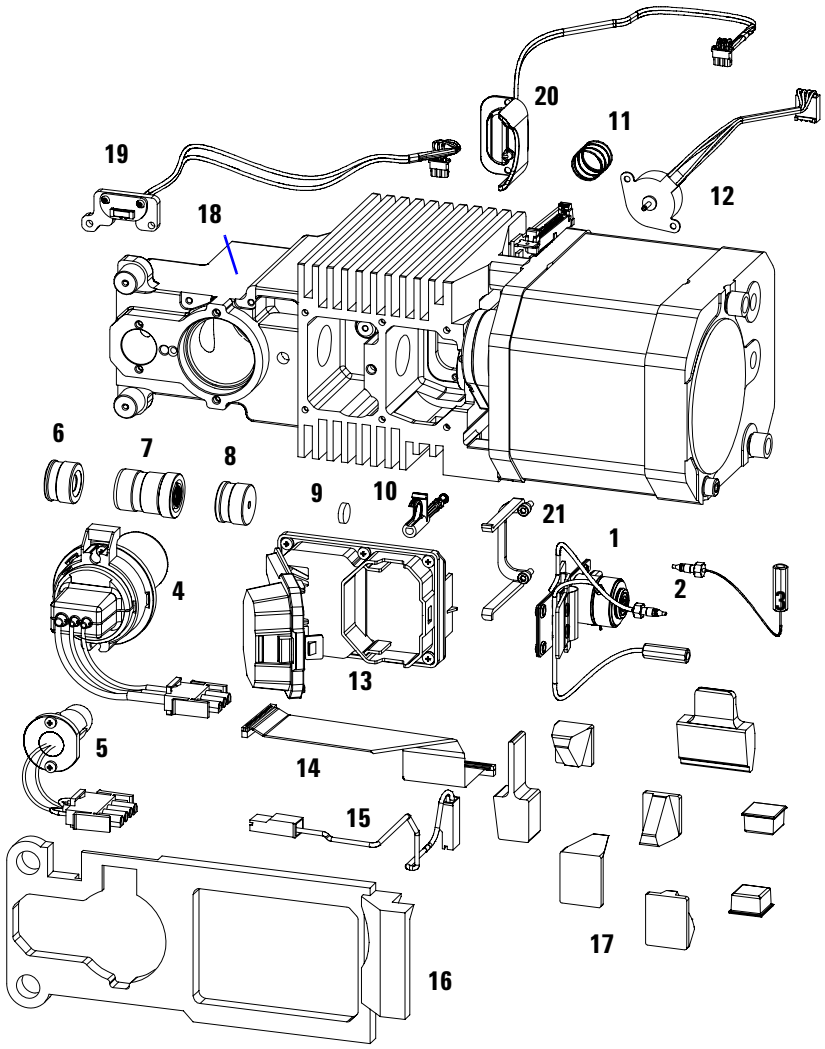

Figure 116 Optical Unit Parts

Table 40 Optical Unit Assembly Repair Parts

Item	Description	Part Number
	Optical unit "C" (for G1315C/G1365C only)	G1315-60102
	Optical unit "C" (exchange assembly, for G1315C/G1365C only)	G1315-69102
1	Flow Cell, for details see "Standard Flow Cell" on page 307, "Semi-Micro Flow Cell" on page 309, "High Pressure Flow Cell" on page 313 or "Nano Flow Cells" on page 319	
2	Capillary column – detector 380 mm lg, 0.17 i.d., see "Accessory Kit" on page 323	G1315-87311
	Teflon tubing flexible i.d. 0.8 mm (flow cell to waste), see "Accessory Kit" on page 323	
3	Zero dead volume fitting	5022-6515
4	Longlife Deuterium lamp "C" with ID tag (with black cover)	2140-0820
5	Tungsten lamp	G1103-60001
6	Coupling lens assembly, for other coupling lens assembly parts, see page 330	G1103-68001
7	Source lens (achromat) assembly, for other source lens assembly parts, see page 331	G1315-65201
8	Cell support assembly, for other cell support assembly parts, see page 332	G1315-65202
9, 10, 11, 12	Holmium oxide filter parts, see page 333	
13	Flow cell door (seal included) Screw Special for flow cell door	G1315-68707 5022-2112
14	Ribbon Cable Optical - Mainboard (LNFE-DADM/MWDM)	G1315-81600
15	Cable (grounding)	G1315-?????
16	Sealing "C" (for G1315C/G1365C only)	G1315-47104
17	Damping kit, includes 6 bumpers	G1315-68706
18	Plug hole for lamp housing	6960-0002
19	Tag Reader Assembly Lamp "C" (for G1315C/G1365C only) Screw M2.2 4.5 mm lg	G1315-60006 0515-4780
20	Tag Reader Assembly Cell "C" (for G1315C/G1365C only) Hex screws M3 8 mm lg	G1315-60005 0515-1050
21	Cell rotation limiter, fixed with the screws of item 20	G1315-26100

Coupling Lens Assembly

Table 41 Coupling Lens Assembly

Item	Description	Part Number
	Coupling lens assembly	G1103-68001
1	Retainer ring	
2	Washer-spring wavy	
3	Lens support	
4	Lens	
5	Lens holder	

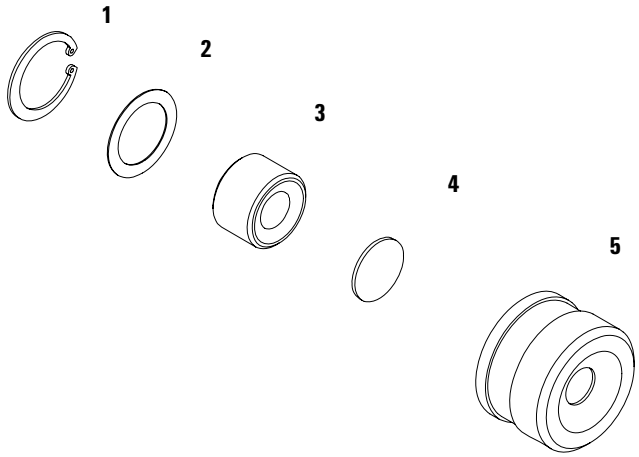

Figure 117 Coupling Lens Assembly Parts

Source Lens (Achromat) Assembly

Table 42 Source Lens Assembly

Item	Description	Part Number
	Source lens (achromat) assembly includes a filter lever G1315-45001	G1315-65201
1	Lens achromatic	1000-0486
2	Spring compression	1460-2255
3	Spectro window	79880-28111
4	Holder	

NOTE When the filter motor has been removed, the filter lever should not be reused. Use always a new filter lever to assure correct fit on the filter motor shaft.

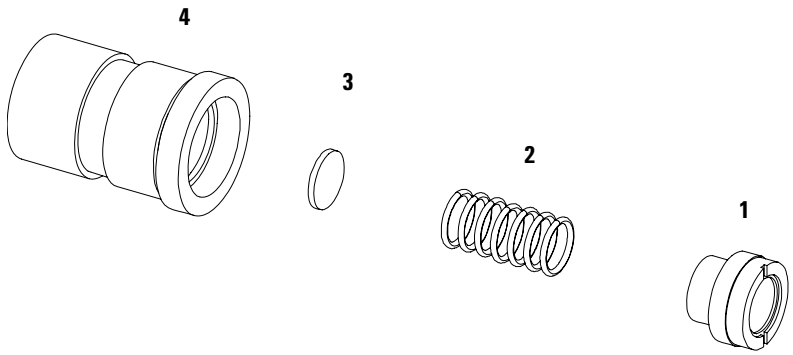

Figure 118 Source Lens (Achromat) Assembly Parts

Cell Support Assembly

Table 43 Cell Support Assembly

Item	Description	Part Number
	Cell support assembly	G1315-65202
1	Retainer ring	0510-1638
2	Washer-spring wavy	3050-1591
3	Spectro window	79880-28111
4	Cell support	G1315-24701

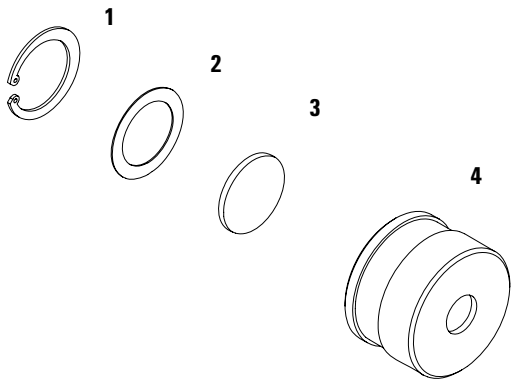

Figure 119 Cell Support Assembly Parts

Holmium Oxide Filter

Table 44 Holmium Oxide Filter Assembly Parts

Item	Description	Part Number
1	Holmium oxide filter motor assembly, includes items 2 and 4	G1315-68700
2	Holmium oxide filter lever	G1315-45001
3	Holmium oxide filter	79880-22711
4	Spring	1460-1510

NOTE When the filter motor has been removed, the filter lever should not be reused. Use always a new filter lever to assure correct fit on the filter motor shaft.

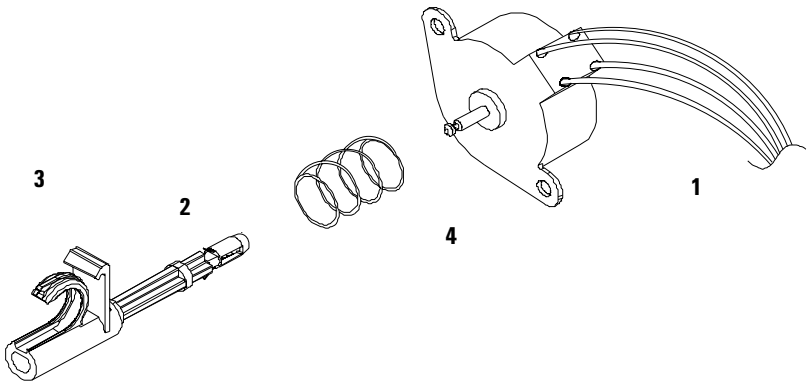

Figure 120 Holmium Oxide Filter Parts

Fan Assembly Parts

Table 45 Fan Assembly Parts

Item	Description	Part Number
1	Fan	3160-1016
2	Heater assembly “C“ 60W (for G1315C/G1365C only)	G1315-60013
3	Temperature sensor assembly	G1315-60003

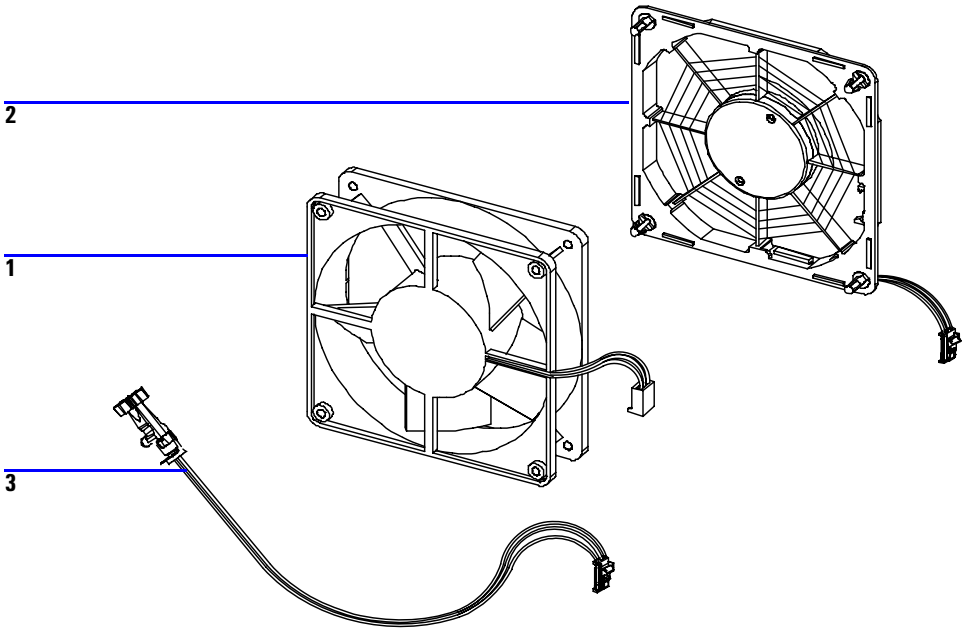

Figure 121 Fan Assembly Parts

Plastic Parts

Table 46 Plastics Parts

Item	Description	Part Number
1	Front cover	5065-9982
2	Plastics, includes base, sides and top	5065-9985
3	Name plate Agilent 1200 Series	5042-8901

NOTE For correct assembling of the top and sides, see "Assembling the Main Cover" on page 302.

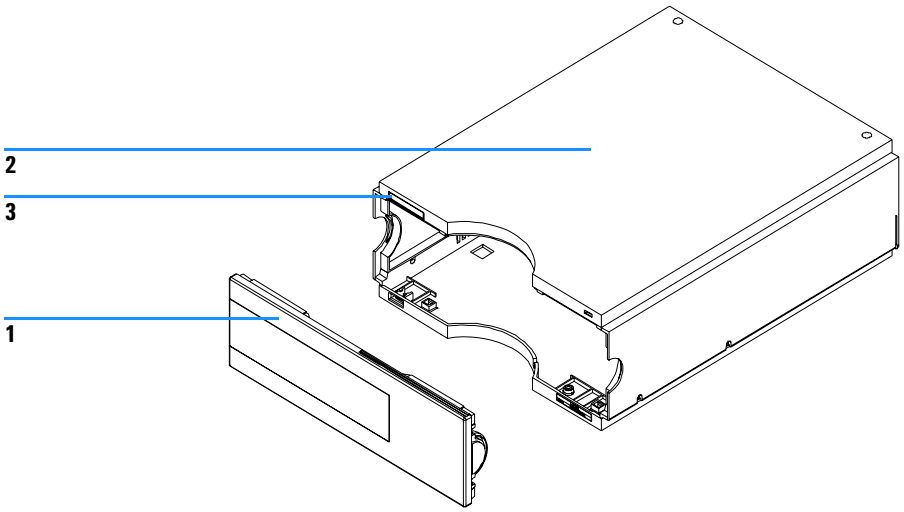

Figure 122 Plastic Parts

Leak Parts

Table 47 Leak Parts

Item	Description	Part Number
1	Leak sensor assembly	5061-3356
2	Leak pan	G1315-45511
3	Leak funnel	5041-8388
4	Leak funnel holder	5041-8389
5	Clip	5041-8387
6, 7	Corrugated tubing, 120 mm lg, re-order 5 m	5062-2463

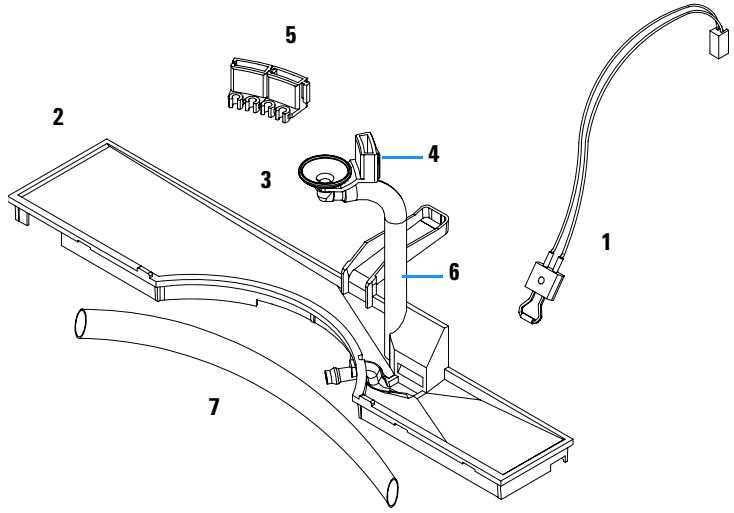

Figure 123 Leak Parts

Foam Parts

Table 48 Foam Parts

Item	Description	Part Number
1, 2	EPP foam kit "C", includes base and top for G1315C/G1365C only)	G1315-68732
3	Damper kit (includes 7 bumpers)	G1315-68706

NOTE Do not order the individual part numbers mentioned on the foam.

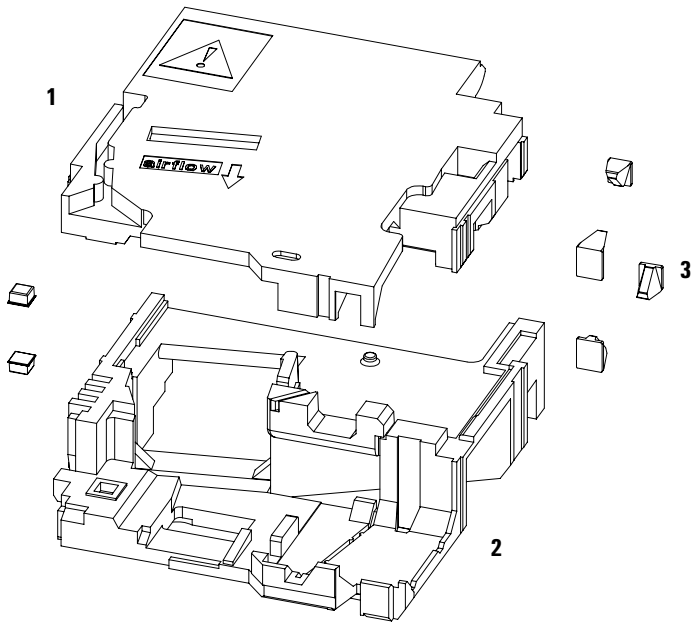

Figure 124 Foam Parts

Power and Status Light Pipes

Table 49 Power and Status Light Pipes

Item	Description	Part Number
	Power supply assembly	0950-2528
	Screw M4 x 0.7, 8 mm lg, to fix power supply at rear panel	0515-0910
	Washer	2190-0409
1	Power light pipe	5041-8382
2	Status light pipe	5041-8384
3	Power switch button	5041-8381
4	Coupler for power supply actuator	5041-8383

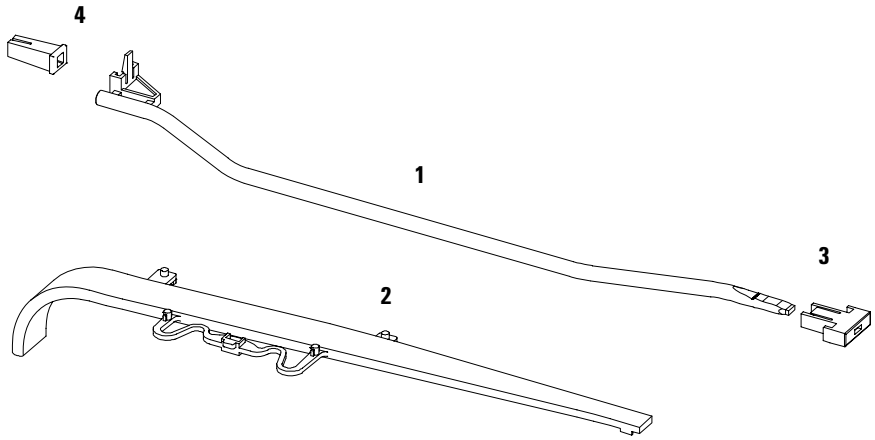

Figure 125 Power and Status Light Pipe

Sheet Metal Kit

Table 50 Sheet Metal Kit Parts

Item	Description	Part Number
1	Sheet metal kit "C" includes case, top cover and front (for G1315C/G1365C only)	G1315-68717
2	Screws M3 for cover and flow cell door	5022-2112
3a	Thumb screw for union holder	0515-2769
3b	Zero dead volume fitting	5022-2184
3c	Union holder clamp	G1315-05205

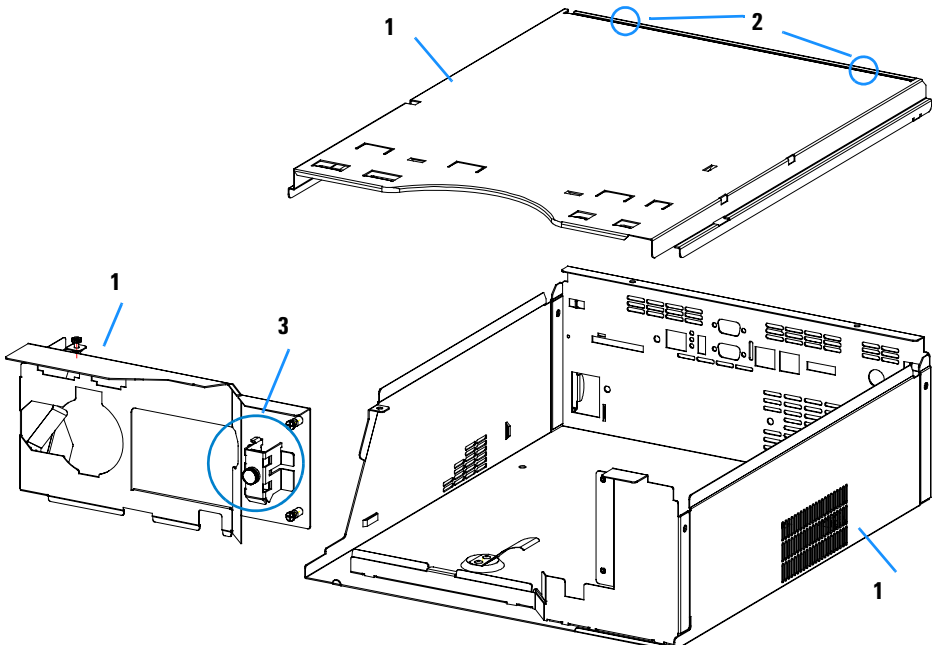

Figure 126 Sheet Metal Kit Parts

16
Identifying Cables

Cable Overview 342
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Remote Cables 347
BCD Cables 352
Auxiliary Cable 354
CAN Cable 355
External Contact Cable 356
RS-232 Cable Kit 357
LAN Cables 358

This chapter provides information on cables used with the 1200 series of HPLC modules.

Cable Overview

WARNING **Never use cables other than the ones supplied by Agilent Technologies to ensure proper functionality and compliance with safety or EMC regulations.**

Table 51 Cables Overview

Type	Description	Part Number
Analog cables	3390/2/3 integrators	01040-60101
	3394/6 integrators	35900-60750
	35900A A/D converter	35900-60750
	General purpose (spade lugs)	01046-60105
Remote cables	3390 integrator	01046-60203
	3392/3 integrators	01046-60206
	3394 integrator	01046-60210
	3396A (Series I) integrator	03394-60600
	3396 Series II / 3395A integrator, see page 349	
	3396 Series III / 3395B integrator	03396-61010
	Agilent 1200/ 1100 / 1050 modules / 1046A FLD	5061-3378
	1046A FLD	5061-3378
	35900A A/D converter	5061-3378
	1090 liquid chromatographs	01046-60202
	Signal distribution module	01046-60202

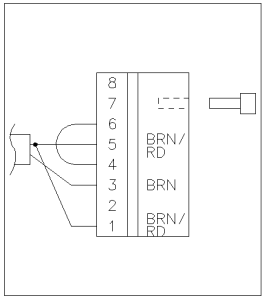
Table 51 Cables Overview, continued

Type	Description	Part Number
BCD cables	3396 integrator	03396-60560
	General purpose (spade Lugs)	G1351-81600
Auxiliary	Agilent 1200 Series vacuum degasser	G1322-61600
CAN cables	Agilent 1200 module to module, 0.5 m	5181-1516
	Agilent 1200 module to module, 1 m	5181-1519
	Agilent 1200 module to control module	G1323-81600
External contacts	Agilent 1200 Series interface board to general purpose	G1103-61611
GPIB cable	Agilent 1200 module to Agilent ChemStation, 1 m	10833A
	Agilent 1200 module to Agilent ChemStation, 2 m	10833B
RS-232 cable	Agilent 1200 module to a computer This kit contains a 9-pin female to 9-pin female Null Modem (printer) cable and one adapter.	34398A
LAN cable	Cross-over network cable (shielded, 3 m long), (for point to point connection)	5023-0203
	Twisted pair network cable (shielded, 7 m long) (for hub connections)	5023-0202

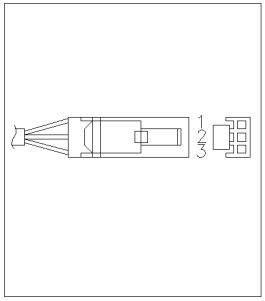
Analog Cables

One end of these cables provides a BNC connector to be connected to Agilent 1200 Series modules. The other end depends on the instrument to which connection is being made.

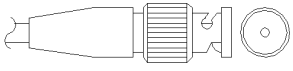
Agilent 1200 to 3390/2/3 Integrators

Connector 01040-60101	Pin 3390/2/3	Pin Agilent 1200	Signal Name
	1	Shield	Ground
	2		Not connected
	3	Center	Signal +
	4		Connected to pin 6
	5	Shield	Analog -
	6		Connected to pin 4
	7		Key
	8		Not connected

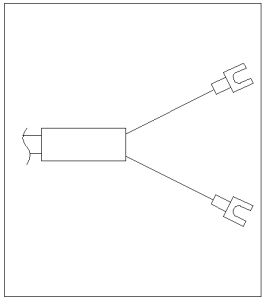
Agilent 1200 to 3394/6 Integrators

Connector 35900-60750	Pin 3394/6	Pin Agilent 1200	Signal Name
	1		Not connected
	2	Shield	Analog -
	3	Center	Analog +

Agilent 1200 to BNC Connector

Connector 8120-1840	Pin BNC	Pin Agilent 1200	Signal Name
	Shield	Shield	Analog -
	Center	Center	Analog +

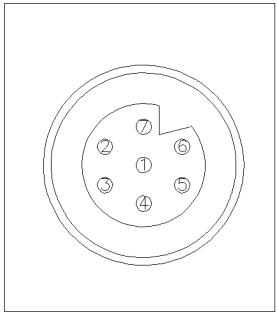
Agilent 1200 to General Purpose

Connector 01046-60105	Pin 3394/6	Pin Agilent 1200	Signal Name
	1		Not connected
	2	Black	Analog -
	3	Red	Analog +

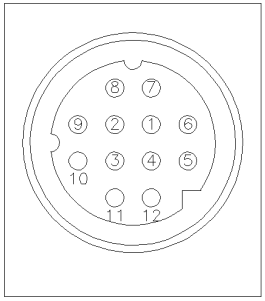
Remote Cables

One end of these cables provides a Agilent Technologies APG (Analytical Products Group) remote connector to be connected to Agilent 1200 Series modules. The other end depends on the instrument to be connected to.

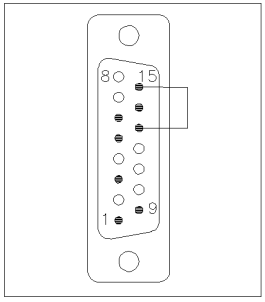
Agilent 1200 to 3390 Integrators

Connector 01046-60203	Pin 3390	Pin Agilent 1200	Signal Name	Active (TTL)
	2	1 - White	Digital ground	
	NC	2 - Brown	Prepare run	Low
	7	3 - Gray	Start	Low
	NC	4 - Blue	Shut down	Low
	NC	5 - Pink	Not connected	
	NC	6 - Yellow	Power on	High
	NC	7 - Red	Ready	High
	NC	8 - Green	Stop	Low
	NC	9 - Black	Start request	Low

Agilent 1200 to 3392/3 Integrators

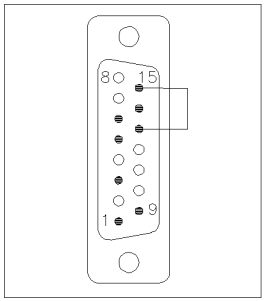
Connector 01046-60206	Pin 3392/3	Pin Agilent 1200	Signal Name	Active (TTL)
	3	1 - White	Digital ground	
	NC	2 - Brown	Prepare run	Low
	11	3 - Gray	Start	Low
	NC	4 - Blue	Shut down	Low
	NC	5 - Pink	Not connected	
	NC	6 - Yellow	Power on	High
	9	7 - Red	Ready	High
4 - Key	1	8 - Green	Stop	Low
	NC	9 - Black	Start request	Low

Agilent 1200 to 3394 Integrators

Connector 01046-60210	Pin 3394	Pin Agilent 1200	Signal Name	Active (TTL)
	9	1 - White	Digital ground	
	NC	2 - Brown	Prepare run	Low
	3	3 - Gray	Start	Low
	NC	4 - Blue	Shut down	Low
	NC	5 - Pink	Not connected	
	NC	6 - Yellow	Power on	High
	5,14	7 - Red	Ready	High
	6	8 - Green	Stop	Low
	1	9 - Black	Start request	Low
	13, 15		Not connected	

NOTE START and STOP are connected via diodes to pin 3 of the 3394 connector.

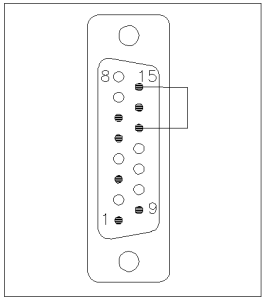
Agilent 1200 to 3396A Integrators

Connector 03394-60600	Pin 3394	Pin Agilent 1200	Signal Name	Active (TTL)
	9	1 - White	Digital ground	
	NC	2 - Brown	Prepare run	Low
	3	3 - Gray	Start	Low
	NC	4 - Blue	Shut down	Low
	NC	5 - Pink	Not connected	
	NC	6 - Yellow	Power on	High
	5,14	7 - Red	Ready	High
	1	8 - Green	Stop	Low
	NC	9 - Black	Start request	Low
	13, 15		Not connected	

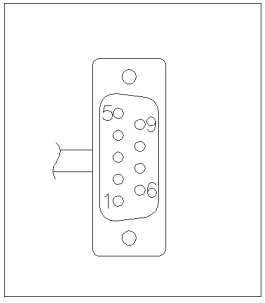
Agilent 1200 to 3396 Series II / 3395A Integrators

Use the cable 03394-60600 and cut pin #5 on the integrator side. Otherwise the integrator prints START; not ready.

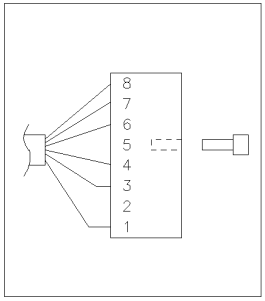
Agilent 1200 to 3396 Series III / 3395B Integrators

Connector 03396-61010	Pin 33XX	Pin Agilent 1200	Signal Name	Active (TTL)
	9	1 - White	Digital ground	
	NC	2 - Brown	Prepare run	Low
	3	3 - Gray	Start	Low
	NC	4 - Blue	Shut down	Low
	NC	5 - Pink	Not connected	
	NC	6 - Yellow	Power on	High
	14	7 - Red	Ready	High
	4	8 - Green	Stop	Low
	NC	9 - Black	Start request	Low
	13, 15		Not connected	

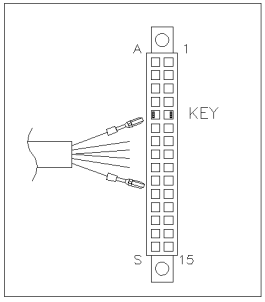
Agilent 1200 to HP 1050, HP 1046A or Agilent 35900 A/D Converters

Connector 5061-3378	Pin HP 1050 / ...	Pin Agilent 1200	Signal Name	Active (TTL)
	1 - White	1 - White	Digital ground	
	2 - Brown	2 - Brown	Prepare run	Low
	3 - Gray	3 - Gray	Start	Low
	4 - Blue	4 - Blue	Shut down	Low
	5 - Pink	5 - Pink	Not connected	
	6 - Yellow	6 - Yellow	Power on	High
	7 - Red	7 - Red	Ready	High
	8 - Green	8 - Green	Stop	Low
	9 - Black	9 - Black	Start request	Low

Agilent 1200 to HP 1090 LC or Signal Distribution Module

Connector 01046-60202	Pin HP 1090	Pin Agilent 1200	Signal Name	Active (TTL)
	1	1 - White	Digital ground	
	NC	2 - Brown	Prepare run	Low
	4	3 - Gray	Start	Low
	7	4 - Blue	Shut down	Low
	8	5 - Pink	Not connected	
	NC	6 - Yellow	Power on	High
	3	7 - Red	Ready	High
5 - Key	6	8 - Green	Stop	Low
	NC	9 - Black	Start request	Low

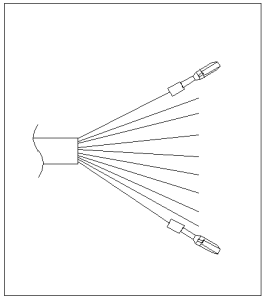
Agilent 1200 to General Purpose

Connector 01046-60201	Pin Universal	Pin Agilent 1200	Signal Name	Active (TTL)
		1 - White	Digital ground	
		2 - Brown	Prepare run	Low
		3 - Gray	Start	Low
		4 - Blue	Shut down	Low
		5 - Pink	Not connected	
		6 - Yellow	Power on	High
		7 - Red	Ready	High
		8 - Green	Stop	Low
		9 - Black	Start request	Low

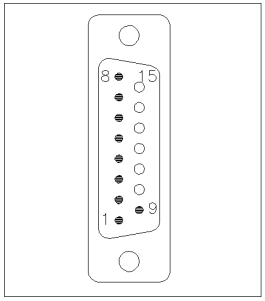
BCD Cables

One end of these cables provides a 15-pin BCD connector to be connected to the Agilent 1200 Series modules. The other end depends on the instrument to be connected to

Agilent 1200 to General Purpose

Connector G1351-81600	Wire Color	Pin Agilent 1200	Signal Name	BCD Digit
	Green	1	BCD 5	20
	Violet	2	BCD 7	80
	Blue	3	BCD 6	40
	Yellow	4	BCD 4	10
	Black	5	BCD 0	1
	Orange	6	BCD 3	8
	Red	7	BCD 2	4
	Brown	8	BCD 1	2
	Gray	9	Digital ground	Gray
	Gray/pink	10	BCD 11	800
	Red/blue	11	BCD 10	400
	White/green	12	BCD 9	200
	Brown/green	13	BCD 8	100
	not connected	14		
	not connected	15	+5 V	Low

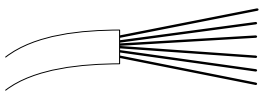
Agilent 1200 to 3396 Integrators

Connector 03396-60560	Pin 3392/3	Pin Agilent 1200	Signal Name	BCD Digit
	1	1	BCD 5	20
	2	2	BCD 7	80
	3	3	BCD 6	40
	4	4	BCD 4	10
	5	5	BCD0	1
	6	6	BCD 3	8
	7	7	BCD 2	4
	8	8	BCD 1	2
	9	9	Digital ground	
	NC	15	+ 5 V	Low

Auxiliary Cable

One end of this cable provides a modular plug to be connected to the Agilent 1200 Series vacuum degasser. The other end is for general purpose.

Agilent 1200 Series Degasser to general purposes

Connector G1322-61600	Color	Pin Agilent 1200	Signal Name
	White	1	Ground
	Brown	2	Pressure signal
	Green	3	
	Yellow	4	
	Grey	5	DC + 5 V IN
	Pink	6	Vent

CAN Cable

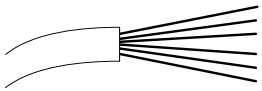
Both ends of this cable provide a modular plug to be connected to Agilent 1200 Series module's CAN-bus connectors.

Agilent 1200 module to module, 0.5 m	5181-1516
Agilent 1200 module to module, 1 m	5181-1519
Agilent 1200 module to control module	G1323-81600

External Contact Cable

One end of this cable provides a 15-pin plug to be connected to Agilent 1200 Series module's interface board. The other end is for general purpose.

Agilent 1200 Series Interface Board to general purposes

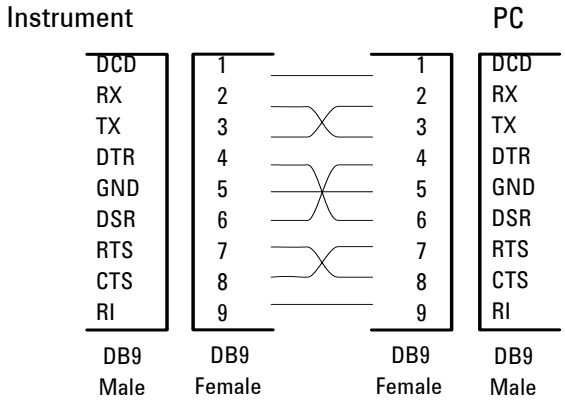
Connector G1103-61611	Color	Pin Agilent 1200	Signal Name
	White	1	EXT 1
	Brown	2	EXT 1
	Green	3	EXT 2
	Yellow	4	EXT 2
	Grey	5	EXT 3
	Pink	6	EXT 3
	Blue	7	EXT 4
	Red	8	EXT 4
	Black	9	Not connected
	Violet	10	Not connected
	Grey/pink	11	Not connected
	Red/blue	12	Not connected
	White/green	13	Not connected
	Brown/green	14	Not connected
	White/yellow	15	Not connected

RS-232 Cable Kit

This kit contains a 9-pin female to 9-pin female Null Modem (printer) cable and one adapter. Use the cable and adapter to connect Aligent Technologies instruments with 9-pin male RS-232 connectors to most PCs or printers.

Agilent 1200 module to PC

RS-232 Cable Kit 34398As



LAN Cables

Recommended Cables

Table 52

Description	Part number
Cross-over network cable (shielded, 3 m long), (for point to point connection)	5023-0203
Twisted pair network cable (shielded, 7 m long), (for hub connections)	5023-0202

17
Hardware Information

Detector Main Board (DADM/MWDM) 360
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Firmware Description 376
The Main Power Supply Assembly 378

This chapter describes the detector in more detail on hardware and electronics.

Detector Main Board (DADM/MWDM)

This board controls all information and activities of all assemblies within the detector. Through interfaces (LAN, CAN or RS-232C) connected to the user interface, the operator enters parameters, changes modes and controls the detector.

Main features:

- lamp supply for UV- and Vis-lamp,
- CompactFlash card slot for (standard for G1315C DAD SLand G1365C MWD SL),
- identification tag operation for flow cell and UV-lamp,
- temperature control for optical unit for stable baseline,
- LAN on-board,
- CAN for internal 1200 interfacing,
- RS-232 for third part control or service,
- 2 analog outputs (0 - 1 V or 0 - 100 mV full scale),
- leak sensing (flow cell),
- safety switch turns off high voltages/fan,
- USB for future use,
- no individual battery.

Firmware

For an outline of the firmware, see “Firmware Description” on page 376.

Leak Sensor

The detector has a PTC for the leak detection and a NTC for the ambient temperature compensation. A leak would cool down the PTC and this change in resistance would generate a leak signal.

Fan Drive

The operation of the fan is controlled by the main processor and runs with constant revolution. The fan produces a sense signal which is derived from the revolution. This sense signal is used for diagnostics.

Analog Signal Outputs

There are two independent analog outputs (0...1 V or 0...100 mV full scale). For analog cables, refer to “Analog Cables” on page 344.

Deuterium Lamp Filament and Current Control

Before ignition, the deuterium lamp filament control circuit provides a constant voltage of 2.5 VDC to the filament of the deuterium lamp. After ignition, the filament heating is turned off. Then the constant current source of 320 mA at an operating voltage of about 85 VDC for stable operating conditions and light emission of the deuterium lamp.

If the deuterium lamp failed to ignite, the whole sequence is repeated after a wait sequence for cooling down. If the deuterium lamp still does not ignite, an error message occurs.

Tungsten Lamp Voltage Control

The tungsten lamp is operated at a constant voltage of approx. 5.5 VDC.

Safety Switches

If the EPP foam is removed while the instrument is still on, the safety light switches are activated and the deuterium lamp and the tungsten lamp are switched off.

Interfaces

For detailed information on interfaces (LAN, CAN, RS-232), see "Interfaces" on page 367.

Temperature Control

The G1315C/D and G1365C/D detectors are equipped with a temperature control to improve the baseline stability in unstable environments (e.g. strong variation of the temperature due to air condition systems). A heater and a temperature sensor assembly have been added and are controlled by the detector main board and its firmware. There are no parameters to be set for the temperature control.

Internal Clock without Battery

There is no battery on the main board that buffers the module clock. The voltage for the clock is supplied by a capacitor that provides the voltage for minimum 4 weeks. After that time the clock stops and at next power on it will synchronize with the clock from the Agilent ChemStation.

Lamp and Flow Cell RFID Tag

The Agilent G1315C/D and G1365C/D are equipped with a lamp/flow cell-identification system. This allows to write and to read lamp/flow cell-specific information to and from the lamp/flow cell-identification tag, see Table 53.

Table 53 RFID Tag Data

Lamp information	Flow cell information
• product number	• product number
• serial number	• serial number
• production date	• production date
• accumulated UV on time	• nominal path length of the cell
• actual UV lamp on time	• cell volume (in nl)
• number of ignitions	• maximum pressure (in bar)
• date of last intensity test	• date of last cell test

NOTE This feature is available for special lamps and flow cells mentioned in chapter "Parts and Materials for Maintenance" on page 303 or "Parts for Repairs" on page 325.

CompactFlash Card Slot

Below the PCMCIA slot (Figure 127), the detector has a CompactFlash card slot (G1315C DAD and G1365C MWD only).

NOTE The G1315C DAD and G1365C MWD are tested with the supplied CompactFlash card only. Other CompactFlash cards may vary slightly and may not work correctly.

The CompactFlash card allows constant buffering of data/spectra information so that in case of

- a busy ChemStation, that cannot take the data from the detector in time or
- a lost network connection

no application data of the detector is lost.

NOTE The G1315C DAD must be operated with the CompactFlash card due to the high data rate. Otherwise an error on the ChemStation will show up.

PCMCIA Slot

The PCMICIA slot has been removed from all detectors in November 2006 with the introduction of the G1315D DAD and G1365D MWD.

USB

The USB connector is not active yet. Will be used for future enhancements.

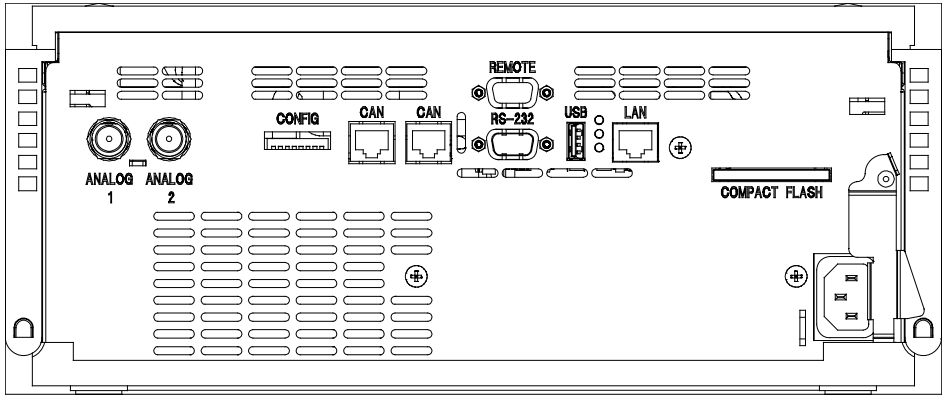

Figure 127 Rear View of Detector

Board Layout and Connectors

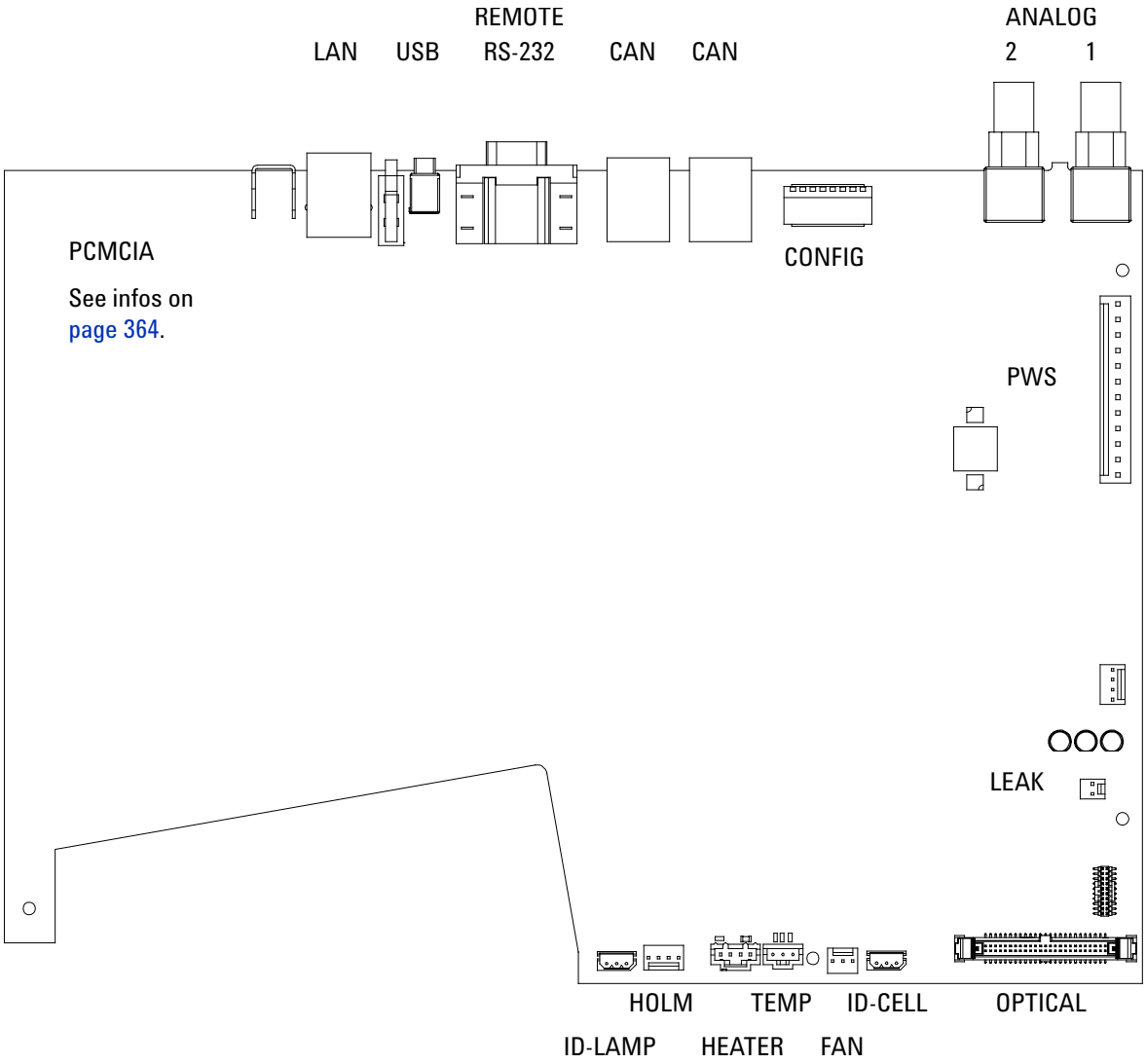

Figure 128 Main Board - Layout and Connectors

Table 54 lists the connectors on the main board.

Table 54 Connections on the main board (see Figure 128 on page 365)

Connector	Description	Connector	Description
PCMCIA	has been removed	OPTICAL	connects to optical unit
LAN	connects to LAN interface	ID-CELL	connects to ID-reader of flow cell
USB	for future use	FAN	connects to the fan
REMOTE	remote control	TEMP	connects to temperature sensor
CAN	inter-module communication	HEATER	connects to heater
ANALOG	signal to plotter or data system	HOLM	connects to stepper motor
PWS	connects to power supply	ID-LAMP	connects to ID-reader of UV-lamp
LEAK	connects to leak sensor		

Interfaces

The Agilent 1200 Series modules provide the following interfaces:

Table 55 Agilent 1200 Series Interfaces

Interface Type	Pumps	Autosampler	DA Detector MW Detector FL Detector	DA Detector G1315C/D MW Detector G1365C/D	VW Detector RI Detector	Thermostatted Column Compartment	Vacuum Degasser
CAN	Yes	Yes	Yes	Yes	Yes	Yes	No
LAN (on-board)	No	No	No	Yes	No	No	No
GPIB	Yes	Yes	Yes	No	Yes	Yes	No
RS-232C	Yes	Yes	Yes	Yes	Yes	Yes	No
Remote	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Analog	Yes	No	2 ×	2 ×	1 ×	No	Yes*
Interface board (LAN/BCD/Ext)	Yes	Yes	Yes	No	Yes	No	No

* The vacuum degasser will have a special connector for specific use. For details see description of main board.

- CAN connectors as interface to other Agilent 1200 Series modules,
- LAN connector as interface to the Agilent ChemStation,
- GPIB connector as interface to the Agilent ChemStation,
- RS-232C as interface to a computer,
- REMOTE connector as interface to other Agilent products,
- Analog Output connector(s) for signal output, and
- Interface slot for specific interfacing (external contacts, BCD, LAN and so on).

For identification and location of the connectors “Electrical Connections” on page 23.

WARNING **Never use cables other than the ones supplied by Agilent Technologies to ensure proper functionality and compliance with safety or EMC regulations, see "Cable Overview" on page 342.**

Analog Signal Output

The analog signal output can be distributed to a recording device. For details refer to the description of the module's main board.

LAN Interface

The LAN interface is used to connect the module with a computer. The settings of configuration switch determines the LAN operation of your module. The switches are preset to a default and recognized by the operating software from Aligent Technologies. For details see "LAN Configuration" on page 47.

CAN Interface

The CAN is an intermodule communication interface. It is a 2-wire serial bus system supporting high speed data communication and real-time requirement.

Remote Interface

The APG remote connector may be used in combination with other analytical instruments from Aligent Technologies if you want to use features such as common shut down, prepare, and so on.

Remote control allows easy connection between single instruments or systems to ensure coordinated analysis with simple coupling requirements.

The subminiature D connector is used. The module provides one remote connector which is inputs/outputs (wired-or technique).

To provide maximum safety within a distributed analysis system, one line is dedicated to SHUT DOWN the system's critical parts in case any module detects a serious problem. To detect whether all participating modules are switched on or properly powered, one line is defined to summarize the POWER ON state of all connected modules. Control of analysis is maintained by signal readiness READY for next analysis, followed by START of run and optional STOP of run triggered on the respective lines. In addition, PREPARE and START REQUEST may be issued. The signal level is defined as standard TTL levels (0 V is logic true, + 5 V is false). Typical values are:

TTL high out = 2.4V, in = 2.0V

TTL low out = 0.4V, in = 0.8V

Depending on the load, the values can vary.

Table 56 Remote Signal Distribution

Pin	Signal	Description
1	DGND	Digital ground
2	PREPARE	(L) Request to prepare for analysis (for example, calibration, detector lamp on). Receiver is any module performing pre-analysis activities.
3	START	(L) Request to start run / timetable. Receiver is any module performing run-time controlled activities.
4	SHUT DOWN	(L) System has serious problem (for example, leak: stops pump). Receiver is any module capable to reduce safety risk.
5		Not used
6	POWER ON	(H) All modules connected to system are switched on. Receiver is any module relying on operation of others.
7	READY	(H) System is ready for next analysis. Receiver is any sequence controller.
8	STOP	(L) Request to reach system ready state as soon as possible (for example, stop run, abort or finish and stop injection). Receiver is any module performing run-time controlled activities.
9	START REQUEST	(L) Request to start injection cycle (for example, by start key on any module). Receiver is the autosampler.

RS-232C

The RS-232C connector is used to control the instrument from a computer through RS-232C connection, using the appropriate software. This connector can be activated by the configuration switch (not on G1315C/D and G1365C/D).

The RS-232C is designed as DCE (Data Communication Equipment) with a 9-pin male SUB-D type connector. The pins are defined as follows:

Table 57 RS-232C Connection Table

Pin	Direction	Function
1	In	DCD
2	In	RxD
3	Out	TxD
4	Out	DTR
5		Ground
6	In	DSR
7	Out	RTS
8	In	CTS
9	In	RI

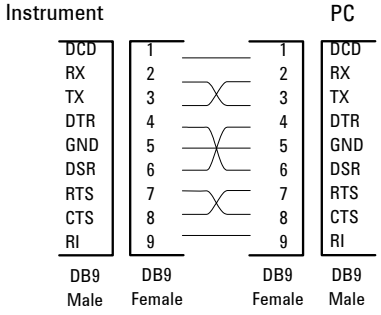

Figure 129 RS-232 Cable

Setting the 8-bit Configuration Switch

NOTE The G1315C/D and G1365C/D have a new main board platform that differs from the other modules. Therefore the use of the 8-bit configuration switch has been changed, Refer to the module specific reference manual in case you need detailed information on an other 1200 module.

The 8-bit configuration switch is located at the rear of the module. Switch settings provide configuration parameters for LAN, serial communication protocol and instrument specific initialization procedures.

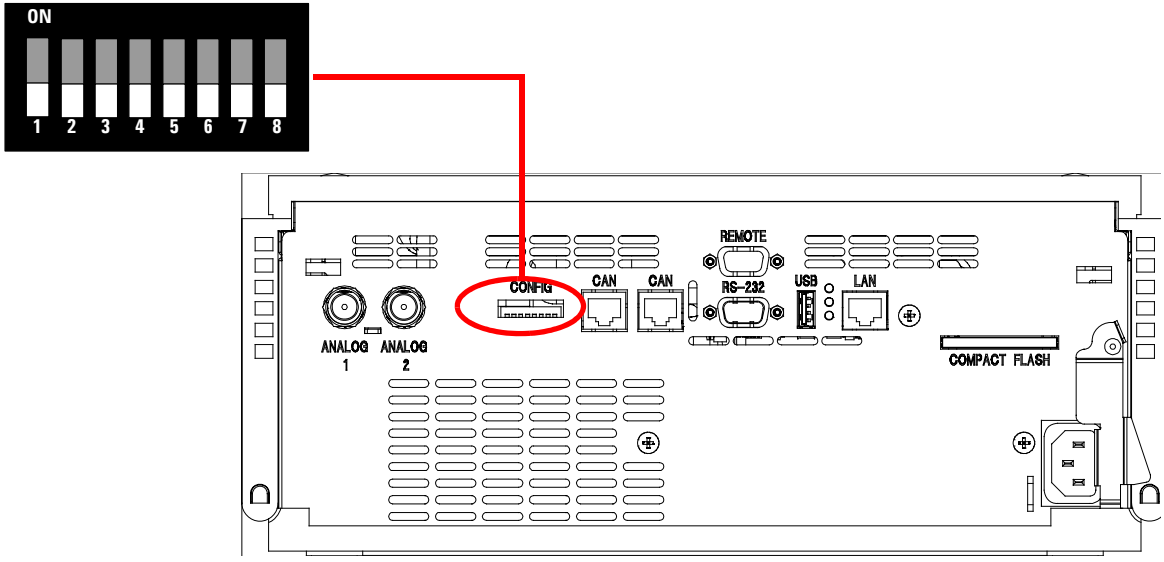

Figure 130 Location of Configuration Switches (G1315C/D and G1365C/D)

NOTE To perform any LAN configuration, SW1 and SW2 must be set to OFF. See also "Configuration Switches" on page 50

Table 58 8-bit Configuration Switch

	Mode		Function					
	SW 1	**SW 2**	**SW 3**	**SW 4**	**SW 5**	**SW 6**	**SW 7**	**SW 8**
LAN	0	0	Link Configuration			Init Mode Selection		
Auto-negotiation			0	x	x	x	x	x
10 MBit, half-duplex			1	0	0	x	x	x
10 MBit, full-duplex			1	0	1	x	x	x
100 MBit, half-duplex			1	1	0	x	x	x
100 MBit, full-duplex			1	1	1	x	x	x
Bootp			x	x	x	0	0	0
Bootp & Store			x	x	x	0	0	1
Using Stored			x	x	x	0	1	0
Using Default			x	x	x	0	1	1
N.A.	0	1	N.A.					
N.A.	1	0	N.A.					
TEST	1	1	System	Debug	Watchdog	N.A.		NVRAM
Boot Resident System			1	x	x			x
Stop Early To Debug			x	1	x			x
Disable Watchdog			x	x	1			x
Revert to Default Data (Coldstart)			x	x	x			1

Legend:

0 (switch down), 1 (switch up), x (any position), N.A. (not assigned)

NOTE When selecting the mode TEST, the LAN settings are: Auto-Negotiation & Using Stored

LAN Settings

For details on the LAN settings/configuration refer to “LAN Configuration” on page 47.

RS-232C Communication Settings

The communication protocol used in this instrument supports only hardware handshake (CTS/RTS). The RS-232 communication is always active (parallel to the CAN and LAN communication). For details see also “RS-232C” on page 371.

Per default, the module will use

- 19200 baud,
- 8 data bit with no parity and
- one start bit and one stop bit are always used (not selectable).

Boot-Resident Settings

Firmware update procedures may require this mode in case of firmware loading errors (main firmware part).

If you use the following switch settings and power the instrument up again, the instrument firmware stays in the resident mode. It is not operable as a detector. It only uses basic functions of the operating system for example, for communication. In this mode the main firmware can be loaded (using update utilities).

Table 59 Stay Resident Settings

Mode Select	SW 1	SW 2	SW 3	SW 4	SW 5	SW 6	SW 7	SW 8
TEST/BOOT	**1**	**1**	**1**	0	0	0	0	0

Forced Cold Start Settings

A forced cold start can be used to bring the module into a defined mode with default parameter settings.

CAUTION Forced cold start erases all methods and data stored in the non-volatile memory. Exceptions are diagnose and repair log books which will not be erased.

If you use the following switch settings and power the instrument up again, a forced cold start has been completed.

Table 60 Forced Cold Start Settings

Mode Select	SW 1	SW 2	SW 3	SW 4	SW 5	SW 6	SW 7	SW 8
TEST/BOOT	**1**	**1**	0	0	0	0	0	**1**

To return to normal operation, set switches back to your default configuration settings.

Firmware Description

The firmware of the instrument consists of two independent sections:

- a non-instrument specific section, called **resident system**,
- an instrument specific section, called **main system**.

Resident System

This resident section of the firmware is identical for all Agilent 1200 series modules. Its properties are:

- the complete communication capabilities (CAN and RS-232C),
- memory management,
- ability to update the firmware of the ‘main system’.

Main System

Its properties are:

- the complete communication capabilities (CAN, LAN and RS-232C),
- memory management,
- ability to update the firmware of the resident system.

In addition the main system comprises the instrument functions that are divided into common functions like

- run synchronization through APG remote
- error handling,
- diagnostic functions,
- or module specific functions like
  - internal events such as lamp control, filter movements,
  - raw data collection and conversion to absorbance.

Firmware Updates

Firmware updates can be done using your user interface:

- handheld control module with files from a PC-card or
- PC and Firmware Update Tool with local files on the hard disk.

The file naming conventions are:

PPPPRVVV_XX.dlb, where

PPPP	is the product number, for example, 1315 for the G1315 DAD,
R	the firmware revision, for example, B for the G1315C DAD,
VVV	is the revision number, for example 101 is revision 1.01
XX	is the build number of the firmware

For instructions on firmware updates refer to "Replacing the Detector's Firmware" on page 242.

NOTE

Update of main system can be done in the resident system only.

Update of the resident system can be done in the main system only.

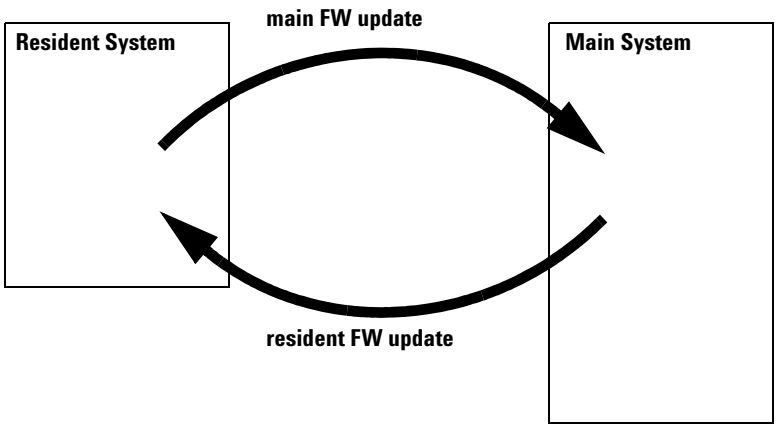

Figure 131 Firmware Update Mechanism

The Main Power Supply Assembly

The main power supply comprises a closed assembly (no onsite repair possibility).

The power supply provides all DC voltages used in the module except for the voltages supplied by the lamp power supply to the deuterium and tungsten lamps in the detectors. The line voltage can vary in a range from 100 – 240 volts AC ± 10 % and needs no manual setting.

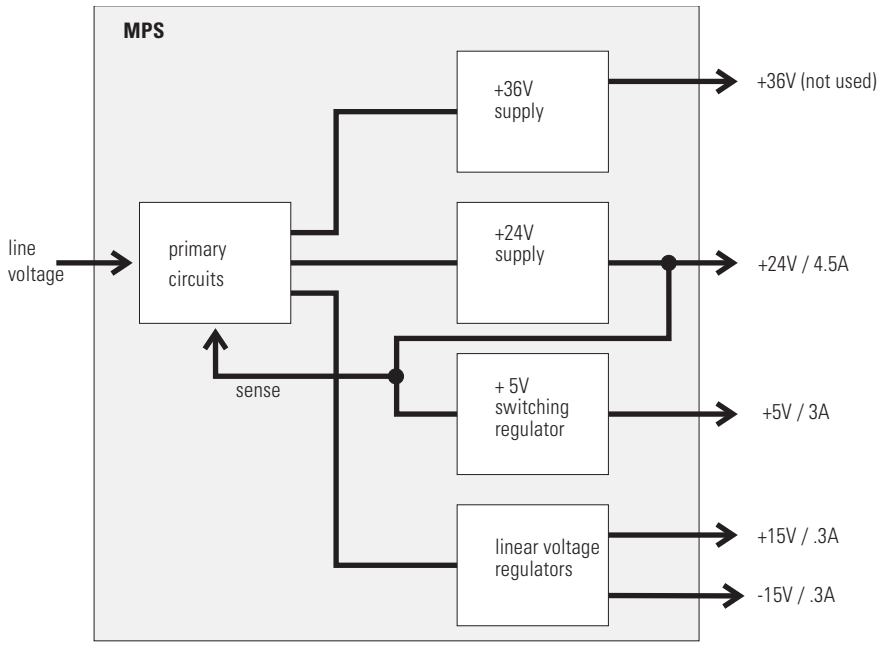

Figure 132 Main Power Supply (MPS) Block diagram

WARNING **To disconnect the instrument from line, unplug the power cord. The power supply still uses some power, even if the power switch on the front panel is turned off.**

No accessible hardware fuse is needed because the main power supply is safe against any short circuits or overload conditions on the output lines. When overload conditions occur, the power supply turns off all output voltages. Turning the line power off and on again resets the power supply to normal operation if the cause of the overload condition has been removed.

An over-temperature sensor in the main power supply is used to turn off output voltages if the temperature exceeds the acceptable limit (for example, if the cooling fan of the instrument fails). To reset the main power supply to normal operating conditions, turn the instrument off, wait until it is approximately at ambient temperature and turn the instrument on again.

The following table gives the specifications of the main power supply.

Table 61 Main Power Supply Specifications

Maximum power	160 VA / 130 W	Continuous output
Line Input	100 – 240 volts AC ± 10 %, line frequency of 50/60 Hz	Wide ranging
Output 1	+ 24 V / 4.5 A (maximum)	total power consumption of + 24 V and + 36 V must not exceed 107 W.
Output 2	+ 36 V / 2.5 A (maximum)	
Output 3	+ 5 V / 3 A	
Output 4	+ 15 V / 0.3 A	
Output 5	- 15 V / 0.3 A	

A
Appendix

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This chapter provides addition information on safety, legal and web.

General Safety Information

The following general safety precautions must be observed during all phases of operation, service, and repair of this instrument. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the instrument. Aligent Technologies assumes no liability for the customer's failure to comply with these requirements.

General

This is a Safety Class I instrument (provided with terminal for protective earthing) and has been manufactured and tested according to international safety standards.

This instrument is designed and certified as a general purpose laboratory instrument for research and routine application only. It is not certified for in-vitro or medical applications.

Operation

Before applying power, comply with the installation section. Additionally the following must be observed.

Do not remove instrument covers when operating. Before the instrument is switched on, all protective earth terminals, extension cords, auto-transformers, and devices connected to it must be connected to a protective earth via a ground socket. Any interruption of the protective earth grounding will cause a potential shock hazard that could result in serious personal injury. Whenever it is likely that the protection has been impaired, the instrument must be made inoperative and be secured against any intended operation.

Make sure that only fuses with the required rated current and of the specified type (normal blow, time delay, and so on) are used for replacement. The use of repaired fuses and the short-circuiting of fuseholders must be avoided.

CAUTION The operator of this instrument is advised that if the equipment is used in a manner not specified in this manual, the protection provided by the equipment may be impaired.

Some adjustments described in the manual, are made with power supplied to the instrument, and protective covers removed. Energy available at many points may, if contacted, result in personal injury.

Any adjustment, maintenance, and repair of the opened instrument under voltage should be avoided as much as possible. When inevitable, this should be carried out by a skilled person who is aware of the hazard involved. Do not attempt internal service or adjustment unless another person, capable of rendering first aid and resuscitation, is present. Do not replace components with power cable connected.

Do not operate the instrument in the presence of flammable gases or fumes. Operation of any electrical instrument in such an environment constitutes a definite safety hazard.

Do not install substitute parts or make any unauthorized modification to the instrument.

Capacitors inside the instrument may still be charged, even though the instrument has been disconnected from its source of supply. Dangerous voltages, capable of causing serious personal injury, are present in this instrument. Use extreme caution when handling, testing and adjusting.

When working with solvents please observe appropriate safety procedures (e.g. goggles, safety gloves and protective clothing) as described in the material handling and safety data sheet by the solvent vendor, especially when toxic or hazardous solvents are used.

Safety Symbols

Table 62 shows safety symbols used on the instrument and in the manuals.

Table 62 Safety Symbols

Symbol	Description
	The apparatus is marked with this symbol when the user should refer to the instruction manual in order to protect risk of harm to the operator and to protect the apparatus against damage.
	Indicates dangerous voltages.
	Indicates a protected ground terminal.
	Indicates eye damage may result from directly viewing the light produced by the deuterium lamp used in this product.

WARNING **A WARNING notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in personal injury or death. Do not proceed beyond a WARNING notice until the indicated conditions are fully understood and met.**

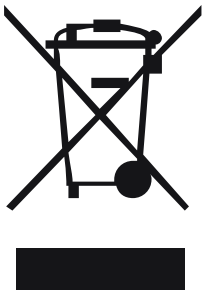
CAUTION A caution alerts you to situations that could cause a possible loss of data. Do not proceed beyond a caution until you have fully understood and met the indicated conditions.

The Waste Electrical and Electronic Equipment (WEEE) Directive (2002/96/EC)

Abstract

The Waste Electrical and Electronic Equipment (WEEE) Directive (2002/96/EC), adopted by EU Commission on 13 February 2003, is introducing producer responsibility on all Electric and Electronic appliances from 13 August 2005.

NOTE



This product complies with the WEEE Directive (2002/96/EC) marking requirements. The affixed label indicates that you must not discard this electrical/electronic product in domestic household waste.

Product Category:
With reference to the equipment types in the WEEE Directive Annex I, this product is classed as a “Monitoring and Control instrumentation” product.

Do not dispose off in domestic household waste

To return unwanted products, contact your local Agilent office, or see www.agilent.com for more information.

Radio Interference

Never use cables other than the ones supplied by Aligent Technologies to ensure proper functionality and compliance with safety or EMC regulations.

Test and Measurement

If test and measurement equipment is operated with equipment unscreened cables and/or used for measurements on open set-ups, the user has to assure that under operating conditions the radio interference limits are still met within the premises.

Sound Emission

Manufacturer's Declaration

This statement is provided to comply with the requirements of the German Sound Emission Directive of 18 January 1991.

This product has a sound pressure emission (at the operator position) < 70 dB.

- Sound Pressure Lp < 70 dB (A)
- At Operator Position
- Normal Operation
- According to ISO 7779:1988/EN 27779/1991 (Type Test)

UV-Radiation

NOTE This information is only valid for UV-lamps without cover (e.g. 2140-0590 and 2140-0813).

Emissions of ultraviolet radiation (200-315 nm) from this product is limited such that radiant exposure incident upon the unprotected skin or eye of operator or service personnel is limited to the following TLVs (Threshold Limit Values) according to the American Conference of Governmental Industrial Hygienists:

Table 63 UV-Radiation Limits

Exposure/day	Effective Irradiance
8 hours	0.1 µW/cm^2
10 minutes	5.0 µW/cm^2

Typically the radiation values are much smaller than these limits:

Table 64 UV-Radiation Typical Values

Position	Effective Irradiance
Lamp installed, 50 cm distance	Average 0.016 µW/cm^2
Lamp installed, 50 cm distance	Maximum 0.14 µW/cm^2

Solvent Information

Observe the following recommendations on the use of solvents.

Flow Cell

Avoid the use of alkaline solutions (pH > 9.5) which can attack quartz and thus impair the optical properties of the flow cell.

Prevent any crystallization of buffer solutions. This will lead into a blockage/damage of the flow cell.

If the flow cell is transported while temperatures are below 5 degree C, it must be assured that the cell is filled with alcohol.

Aqueous solvents in the flow cell can built up algae. Therefore do not leave aqueous solvents sitting in the flow cell. Add small % of organic solvents (e.g. Acetonitrile or Methanol ~5%).

Solvents

Brown glass ware can avoid growth of algae.

Always filter solvents, small particles can permanently block the capillaries. Avoid the use of the following steel-corrosive solvents:

- Solutions of alkali halides and their respective acids (for example, lithium iodide, potassium chloride, and so on).
- High concentrations of inorganic acids like nitric acid, sulfuric acid especially at higher temperatures (replace, if your chromatography method allows, by phosphoric acid or phosphate buffer which are less corrosive against stainless steel).
- Halogenated solvents or mixtures which form radicals and/or acids, for example:

  $2CHCl_3 + O_2 \rightarrow 2COCl_2 + 2HCl$

  This reaction, in which stainless steel probably acts as a catalyst, occurs quickly with dried chloroform if the drying process removes the stabilizing alcohol.

- Chromatographic grade ethers, which can contain peroxides (for example, THF, dioxane, di-isopropylether) such ethers should be filtered through dry aluminium oxide which adsorbs the peroxides.
- Solutions of organic acids (acetic acid, formic acid, and so on) in organic solvents. For example, a 1-% solution of acetic acid in methanol will attack steel.
- Solutions containing strong complexing agents (for example, EDTA, ethylene diamine tetra-acetic acid).
- Mixtures of carbon tetrachloride with 2-propanol or THF.

Declaration of Conformity for HOX2 Filter

Declaration of Conformity

We herewith inform you that the

Holmium Oxide Glass Filter (Type Hoya HY-1)
(Part No. 79880-22711)

meets the following specification of absorbance maxima positions:

Product Number	Series	Measured Wavelength *	Wavelength Accuracy	Optical Bandwidth
79883A	1090	361.0 nm 418.9 nm 453.7 nm 536.7 nm	+/- 1 nm	2 nm
79854A	1050			
G1306A	1050			
G1315A	1100			
G1365A	1100			
G1315B/C/D	1100 / 1200			
G1365B/C/D	1100 / 1200			
G1600				
79853C	1050	360.8nm 418.5nm 536.4nm	+/- 2 nm	6 nm
G1314A/B/C	1100 / 1200	360.8nm 418.5nm 536.4nm	+/- 1 nm	6 nm

*) The variation in Measured Wavelength depends on the different Optical Bandwidth.

Agilent Technologies guarantees the traceability of the specified absorbance maxima to a National Institute of Standards & Technology (NIST) Holmium Oxide Solution Standard with a lot-to-lot tolerance of ± 0.3 nm.

The wavelength calibration filter built into the Agilent Technologies UV-VIS detectors is made of this material and meets these specifications. It is, therefore, suitable for wavelength calibration of these detectors within the specified wavelength accuracy of the respective detector over its wavelength range.

September 15, 2006
(Date)

(Engineering Manager)

(Quality Manager)

P/N 89550-90501	Revision: F Effective by: September 15, 2006	Agilent Technologies

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For the latest information on products and services visit our worldwide web site on the Internet at:

http://www.agilent.com

Select “Life Sciences & Chemical Analysis Solutions” under “Support”

It will provide also the latest firmware of the Agilent 1200 series modules for download.

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In This Book

This manual contains technical reference information about the Agilent 1200 Series diode array and multiple wavlength detectors G1315C/D and G1365C/D.

The manual describes the following:

- introcduction and specifications,
- installation,
- using and optimizing,
- troubleshooting and diagnose,
- maintenance and repair,
- parts identification,
- hardware information,
- safety and related information.

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